STATUS OF THE SPECIES (range-wide and/or recovery unit)

Status common to all species

Our baseline and analysis of effects was based on a landscape comparison at four levels: PALCO lands; action area; regional area; and species-specific range-wide. The PALCO lands encompass approximately 211,000 acres. The action area encompasses 815,063 acres. The regional area encompasses four counties totaling 6,218,220 acres: Mendocino (2,245,940 acres, California Department of Finance 1998a), Humboldt (2,286,590 acres, California Department of Finance 1998b), and Del Norte (645,050 acres, California Department of Finance 1997) Counties, California; and Curry County (1,040,640 acres, Oregon State Archives 1998), Oregon. Variation from this landscape level of analysis, if needed due to limitations of existing data, is described later in this document on a species-specific basis. In addition, the regional area encompasses 2,849,410 acres of redwood forests.

LISTED SPECIES/CRITICAL HABITAT:

American peregrine falcon

A complete, detailed account of the taxonomy, ecology, and reproductive characteristics of the American peregrine falcon may be found in the following documents: *The Pacific Coast American Peregrine Falcon Recovery Plan* (USDI Fish and Wildlife Service 1982) and *Proposed Rule to Remove the Peregrine Falcon in North America from the List of Endangered and Threatened Wildlife: Proposed Rule* (USDI Fish and Wildlife Service 1998).

Species description

The peregrine falcon is a medium-sized, circumpolar raptor weighing approximately 36 ounces. It has a nearly cosmopolitan distribution, occurring on every continent except Antarctica, and has bred over most of its range (Hickey and Anderson 1969). The American peregrine falcon occurs throughout much of North America from the subarctic boreal forests of Alaska and Canada south to Mexico. This subspecies nests from central Alaska, central Yukon Territory, and northern Alberta and Saskatchewan, east to the Maritimes and south (excluding coastal areas north of the Columbia River in Washington and British Columbia) throughout western Canada and the United States to Baja California, Sonora, and the highlands of central Mexico.

Life history

Definition of suitable habitat

The peregrine falcon is found in a wide variety of habitats, including arctic tundra, mountain ranges, open forests, and grasslands. The primary need of this species is nesting cliffs within foraging range of prey species, normally birds.

Reproduction

The peregrine normally lays from 3 to 7 eggs (generally 3 to 4) (Zeiner et al. 1990) during the nesting season, approximately January 1 to June 30. The courtship period begins in early January, when nest site selection occurs and males court females. Fledging begins in late May, but young may still be found in the vicinity of the nest in July or August, especially for pairs nesting in higher altitudes. Successful pairs fledge an average of 2.2 to 2.5 young per breeding season (Monk 1981).

Diet

Prey are primarily small- to medium-sized birds and are captured in spectacular aerial flights, although a few records exist of peregrines taking small mammals, especially bats (Kirven 1978, Monk 1981). In urban environments, the primary prey may be rock doves (*Columba livia*).

Cover requirements

For nest and perch sites, the peregrine falcon prefers tall cliffs that provide protection from mammalian predators and weather. These cliffs are often associated with water bodies and other sources of avian prey. Nest ledges often include a recessed platform that provides protection from inclement weather.

Dispersal

American peregrine falcons that nest in subarctic areas generally winter in South America, while those that nest at lower latitudes exhibit variable migratory behavior. Others (especially coastal birds) may be migratory or may winter and nest in the same region.

Special habitat needs

Well protected, vertical nest cliffs associated with foraging areas are the preferred nesting habitat, although recently peregrines have nested on bridges and high-rise buildings in urban environments. For successful nesting, abundant prey near the nest site is essential. The most preferable nest sites are sheer cliffs 150 feet or more in height, with a small cave or overhung ledge large enough to contain three or four full-grown nestlings. Several holes or ledges that can be used in alternate years are apparently not an absolute requirement but probably increase the suitability of the cliff (USDI Fish and Wildlife Service 1982).

Although some peregrines appear to be somewhat tolerant of human intrusion into the nest area, the species in general is intolerant of disturbance at the nest site. Noise and human presence near the nest site may be of no consequence to the species if these sources are at some distance and are established before the onset of courtship and nest site selection.

Current legal status

Listing history

The peregrine falcon is listed as a California endangered species, a California fully protected species, and a Federal endangered species.

In 1970, the FWS listed the following two of the three North American peregrine falcon subspecies as endangered under the Endangered Species Conservation Act of 1969: the American peregrine falcon and the Arctic peregrine falcon (*F. p. tundrius*). The subspecies were listed due to population declines caused by the negative effects of dichloro-dephenyhl-trichloroethane (DDT) and its metabolites (primarily DDE) on peregrine falcon reproduction and survival.

American and Arctic peregrine falcons were included in the list of threatened and endangered foreign species on June 2, 1970 and the native list of endangered and threatened species on October 13, 1970. Upon passage of the Act, both subspecies were listed as endangered throughout their respective ranges.

On August 26, 1998, the FWS published a proposed rule to delist the American peregrine falcon throughout its range (USDI Fish and Wildlife Service 1998), based on the analysis of recovery goals and current population levels and reproductive rates. Regulations mandate the monitoring of any delisted species for a period not less than 5 years after delisting to ensure that no significant problems arise that would indicate the need to reconsider the delisting decision. Federal delisting of the peregrine falcon will not remove the peregrine falcon from State threatened and endangered species lists or suspend any other legal protections provided by State law.

In the absence of habitat protection under the Act, no other existing Federal laws specifically protect the habitat of this species; however, loss of habitat has not been identified as a primary threat to the species and was not a primary factor identified as contributing to the species original decline.

Six critical habitat units have been designated for American peregrine falcon in the Pacific coast region, all within central and southern California. None of these critical habitat units are within or near the action area.

Current known listed range

The American peregrine falcon is currently listed as an endangered species throughout its range in North America. All subspecies of peregrine falcons are currently protected within the conterminous 48 states under the similarity of appearance criteria.

Reasons for listing

The primary reason for the listing of the American peregrine falcon was significant reduction in numbers and distribution due to reproductive failure, caused primarily by eggshell thinning as a result of accumulations of DDE in its tissues.

An overwhelming body of accumulated evidence shows that organochlorine pesticides affected survival and reproductive performance enough to cause the decline. The scientific community currently does not question that organochloride contamination was the principal cause of the drastic declines and extirpations in peregrine falcon populations that occurred in most parts of North America (USDI Fish and Wildlife Service 1998).

Threats

In some portions of California, the lingering effects of DDT have caused reproductive rates to remain low. Point source contamination may even cause continued reproductive problems in these areas in California. Some predation from great horned owls (*Bubo virginiatus*), other raptors, and mammalian predators has been noted, and several diseases and parasites are known to occur in peregrine populations; however, no information exists as to the level of significance of these potential mortality factors. Additional threats as reported in the Pacific population recovery plan (USDI Fish and Wildlife Service 1982) include collisions with electrical transmissions lines, electrocution, shooting, and the capture of nestlings for falconry. In some California locations, these factors were responsible for a significant portion of the total known mortality.

The peregrine falcon is particularly sensitive to disturbance near the nest cliff during the breeding season. Disturbances may be caused by rock climbers, hikers, overzealous birdwatchers and photographers, and low flying aircraft, among other causes. The effects of disturbances vary with the timing and proximity to the eyrie. Many disturbances are tolerated quite well during the non-breeding season; however, during courtship disturbed birds are particularly liable to desert an area (USDI Fish and Wildlife Service 1982). Even if direct mortality does not occur due to disturbance, the cumulative effects of adults being away from the nest – inadequate brooding of eggs or insufficient feeding of young – can increase the risk of mortality and lower the reproductive rates of the species. If human activities are centered generally throughout the nesting area, the entire territory may be abandoned, and the pair may not nest (Fyfe and Olendorff 1976).

Because rapid population growth rates and high densities were achieved despite considerable habitat modification in North America, habitat modification or destruction has not been a limiting factor in peregrine recovery. The FWS concludes that habitat modification and destruction do not currently threaten the existence of the peregrine falcon nor is this likely in the foreseeable future (USDI Fish and Wildlife Service 1998).

Conservation needs

While habitat loss has not been identified as a limiting factor for the recovery of the species, reduction of reproductive capacity through disturbance at nest sites during the critical nesting period could result in local losses that might significantly affect local populations. Measures to reduce the potential for this disturbance have been implemented for activities within 0.25 miles (up to 0.5 line-of-site miles) of known nest sites during periods when nesting behavior is noted. Generally, this period begins on approximately January 1 and continues until the young are successfully fledged (normally June 30 or later), or until nest abandonment or failure has been documented (Pagel 1992, Pagel 1998).

State and Federal agencies and many private interests are involved in a variety of efforts to increase the numbers of peregrine falcons in the Pacific states. These efforts included captive breeding programs, artificial incubation of eggs, double clutching, foster parenting, captive breeding, and reintroduction by hacking (placing captive hatched juveniles into historic nest sites) (USDI Fish and Wildlife Service 1982).

PALCO lands play a limited role in the conservation of the American peregrine falcon. PALCO lands contain only one known nest site. Two additional nest sites exist in the action area and within approximately 0.5 miles of PALCO lands. PALCO lands offer potential sites and foraging habitat for peregrines in the action area. No specific recovery plan goals are established for lands under PALCO ownership, or for the action area in general.

Status and distribution

Species

Numbers

By the 1960's, the peregrine falcon had essentially been extirpated from the eastern United States and eastern Canada south of the boreal forest. In 1975, there were only three peregrine falcons in Alberta, and no other peregrines were found south of latitude 60 degrees north and east of the Rocky Mountains in Canada. In the western United States, peregrine falcon nesting was reduced to 33 percent of historic nest sites in the Rocky Mountains. Major declines had occurred in other parts of the western United States and western Canada. In contrast, peregrine falcons in most areas of the Pacific coast of Alaska remained fairly stable during this period, owing to lower exposure to organochlorine pesticides.

Currently, populations of American peregrine falcons have increased to a minimum of 1,388 pairs in Alaska, Canada and the western United States, and a minimum of 205 pairs are found in the eastern and midwestern United States. The American peregrine falcon has met or exceeded recovery goals for number of breeding pairs in each of the five recovery areas within its range.

Distribution

Since the early 1970s, efforts to reestablish peregrine falcons in the United States have successfully returned this species to areas from which it had been extirpated. Peregrine falcons are now found nesting in all States within their historical range, except for Rhode Island and Arkansas.

Reproduction

Productivity (measured as the number of young produced per nesting pair per year during the period 1993 through 1997) ranges from 1.4 to 2.0 for the four recovery regions for which productivity goals were established during recovery planning. Productivity goals have been met or exceeded in each of these recovery regions.

Suitable habitat

Amount, acreage, and distribution

Suitable nesting habitat occurs throughout the species range wherever nesting cliffs and ledges occur nearby suitable prey sources. Suitable foraging, dispersal and wintering habitat occurs, likewise, wherever avian prey are present, especially in association with marsh, lacustrine, and marine habitats. Generally, suitable habitat may occur within the historic range of the species wherever sufficient prey species and perch sites might occur. Since suitable habitat occurs widely throughout the species' range, no precise estimate of the acreage is available.

Quality

Although some nest cliffs have been permanently lost to urban development and other landscape modifications (most notably in southern California), there has not been a major range-wide or region-wide loss of suitable nesting cliffs. High-rise buildings and tall bridges currently provide nest sites where none historically existed. Therefore, no major change in nest site quality is known to have occurred, despite local modifications to or loss of suitable nest sites.

Region (includes California, Oregon, Washington and Nevada)

Species

Numbers

Until 1950, reproduction of peregrines in California "was generally successful, and the number of eyrie sites attended by adults was not reduced markedly" (Herman et al. 1970). However, by 1970 the peregrine nearly disappeared as a breeding species in California, with only two confirmed active sites (Herman 1971).

Currently, approximately 239 breeding pairs of peregrine falcons are known to occur within the Pacific coast region (California, Oregon, Washington and Nevada). This exceeds the recovery goal of 185 breeding pairs within this area (as established in the Pacific Coast Recovery Plan (USDI Fish and Wildlife Service 1982)) for delisting the species.

Distribution

The species is widely distributed within the four-state region, except for desert areas of Nevada and southern California. Recovery plan distribution goals for all four states have been met. Recovery of the species in recent years has been enhanced by the widespread introduction of captive-reared juveniles and by nest augmentation. Currently, the species is distributed within this range to the point where additional introductions may no longer be necessary. The release of captive-bred peregrines was suspended in Nevada in 1989 and in California in 1992. The relocation of wild hatchlings continued afterwards.

Reproduction

Available data indicate that the average productivity over the 5-year period 1993 to 1997 in Washington, Oregon and California was 1.5 fledged young per pair per year, which meets the recovery goal for productivity (as established in the Pacific Coast Recovery Plan). Within California, fledging rates currently exceed this goal, at 1.6 young fledged per pair per year (range 1.4 to 1.7). Current reproduction supports an expanding population in most areas despite high organochlorine residue concentrations and associated eggshell thinning that still occurs in some areas of the Pacific population.

Although no recovery goals were established within the Pacific coast region for DDT residues in eggshells and eggshell thinning, eggs from coastal California continue to show residue levels and eggshell thinning that are substantially above pre-DDT era eggs, and remains a cause of concern. However, these levels do not seem to have resulted in limitations on reproduction to the point where recovery of the species has been significantly impaired.

Northern Spotted Owl

A complete, detailed account of the taxonomy, ecology, and reproductive characteristics of the spotted owl is found in the following reports: *Conservation Strategy for the Northern Spotted Owl* (Thomas et al. 1990); the final rule designating the spotted owl as a threatened species (USDI Fish and Wildlife Service 1990a); and *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. Report of the Forest Ecosystem Management Assessment Team* (FEMAT) (USDA Forest Service et al. 1993). A detailed account of the status, distribution, and abundance of the northern spotted owl throughout its range can be found in the following documents: 1987 and 1990 FWS status reviews (USDI Fish and Wildlife Service 1987 and 1990b); the 1989 status review supplement (USDI Fish and Wildlife Service 1989); the FEMAT report (USDA Forest Service et al. 1993); and the biological opinion of the FWS on Alternative 9 of the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (FSEIS) (USDA Forest Service and USDI Bureau of Land Management 1994).

Species description

The northern spotted owl, a medium-sized forest owl, is characterized by dark eyes, a tawny facial disk, and dark- to chestnut-brown feathers. Whitish spots occur on the head and neck, and the abdomen and breast are mottled with white. White bars appear on the tail feathers. The northern spotted owl is distinguished from other subspecies by its darker brown color and smaller white spots and markings.

Plumage characteristics can distinguish several age classes of spotted owls (Forsman 1981). Juvenile (ages 1 day to about 5 months) plumage is downy white; subadult (ages about 6 months to 27 months) plumage is similar to adult plumage, except for white-tipped, pointed tail feathers; adult (about 27 months or greater) tail feathers have rounded tips.

The American Ornithologist Union (1957) recognizes three subspecies of the spotted owl: the California spotted owl (*S. o. occidentalis*); the northern spotted owl; and the Mexican spotted owl (*S. o. lucida*).

Life history

Definition of suitable habitat

The northern spotted owl occurs in most coniferous forest types in the Pacific Northwest. Most observations of spotted owl habitat use are in areas with components of late-successional forests (i.e., mature and old-growth forests). However, spotted owls are observed to use previously logged forests with residual old-forest characteristics (USDI Fish and Wildlife Service 1992a).

Suitable habitat is generally described as: forest stands with multiple canopy layers and a variety of species; moderate to high canopy closure; substantial decadence in the form of live trees with deformities (e.g., cavities, broken tops) and snags; and a large accumulation of logs and woody debris (Thomas et al. 1990). The USDA Forest Service and USDI Bureau of Land Management

(1994) further describe suitable habitat as an area of forest vegetation with the proper conditions (i.e., age class, tree species composition, structure, area, and food source) to meet some or all of the life needs of the northern spotted owl.

Habitat use by the northern spotted owl in California's northern coastal region is described in the SYP/ HCP and in the Final EIS/EIR. In the action area, suitable habitat for the northern spotted owl occurs in California Wildlife Habitat Relationships (CWHR) (Mayer and Laudenslayer 1988) Douglas-fir, montane hardwood-conifer, montane hardwood, and redwood forest types. Suitable habitat is generally described by a combination of vegetational and structural components; data bases limit these components to dominant tree species, tree size, and canopy closure (table 11). Habitat suitability generally increases with increased tree diameter and canopy closure. Moderate and high quality nesting and roosting habitats are generally found in stands with trees greater than 11 inches dbh. Canopy closure of nesting (greater than 60 percent) is greater than that of roosting habitat (greater than 40 percent). Habitat that may be used for foraging includes stands of trees with smaller dbh and sparser canopy closure. These measures of suitable habitat do not address habitat components (i.e., early stages) that provide key habitat areas for the spotted owl's primary prey, the dusky-footed woodrat (*Neotoma fuscipes*).

Table 11. Vegetational and structural components of suitable northern spotted owl habitat on lands owned by PALCO, Humboldt County, California, as described by CWHR habitat types (Final EIS/EIR, appendix P, table 6).

	Vegetation type[1]			
Habitat type	DFR	MHC	MHW	RDW
Nesting:				
High quality	5M[2]	5D	5M	5D
	5D	6	5D	6
	6		6	
Moderate quality	4D	5M	n.a.[3]	4D
				5M
Low quality	n.a.	n.a.	n.a.	5P
Roosting:				
High quality	n.a.	n.a.	n.a.	n.a.
Moderate quality	4M	n.a.	4D	n.a.
Low quality	5P	4M	4M	4M
		4D	5P	
		5P		
Foraging:				
High quality	3D	5S	5S	5S
Moderate quality	3M	4P	4P	3M
	4P			3D
	5S			
Low quality	3P	3M	4S	3P
	4S	3D	3M	4S
		4S	3D	4P

[1] Vegetation type is defined as follows: DFR - Douglas fir; MHC - montane hardwood-conifer; MHW - montane hardwood; and RDW - redwood.

[2] Alpha numeric code indicates tree size and total canopy closure of CWHR habitat type (refer to appendix C). Tree size is defined as follows:

Size	Conifer crown diameter	Hardwood crown diameter	Quadratic mean DBH
3	10-20 feet	10- 30 feet	6-10.99 inches
4	15-30 feet	18- 45 feet	11-23.99 inches
5	20-70 feet	30-100 feet	>24.00 inches
6	n.a.	n.a.	n.a.

Canopy closure is defined as follows: S = sparse cover (10-24.99%); P = open cover (25-39.99%); M = moderate cover (40-59.99%); and D = dense cover (60-100%)

[3] n.a. = not applicable

Reproduction
Spotted owls do not build their own nests; they depend instead upon naturally occurring suitable nest sites. Nests are typically located in tree cavities, or platforms of sticks or other debris on limbs or broken tops of trees (Forsman et al. 1984, La Haye 1988). Of 25 nests checked for 2 or more years, Forsman et al. (1984) observed that 68 percent were used more than 1 year. During an 8-year period, Forsman et al. (1984) found a high attrition rate of nest trees, due to timber harvest, windthrow (i.e., trees being felled by wind), or decay. Platform nests may include abandoned raptor or squirrel nests and clumps of mistletoe or debris. The presence of suitable nest sites is suggested as a possible basis for the use of late successional forests (Forsman et al. 1984). Folliard (1993) and Thome (1997) described nest sites in managed redwood forests in northwestern California; about one-third of nest studied were in stands without old-growth or residual components.

USDI Fish and Wildlife Service (1990a) summarized, in part, the reproductive biology of the northern spotted owl as follows. Female spotted owls are sexually mature in their second year, but most do not breed until their third year. Individual owl pairs do not nest every year. Within the population, both the proportion of territorial pairs attempting to breed and the proportion of pairs successfully breeding vary annually. Fluctuations in the numbers of pairs that breed and/or successfully reproduce may be related to fluctuations in prey populations.

The breeding season of the northern spotted owl lasts several months. The nuptial phase, including copulation, begins in February or early March, usually in the vicinity of the nest used in the previous year. Some pairs use previous nests repeatedly, some select a new site each year, and others use alternate nest sites from year to year. Egg laying (normally one or two eggs, occasionally three eggs, and rarely four) and incubation are initiated during March or April, with the incubation period lasting approximately 30 days. Pairs are unlikely to re-nest if nests fail. Young owls leave the nest approximately 35 days after hatching and remain near the nest tree during summer. As late summer and fall approach, young owls wander farther from the nest tree. Adult owls feed their young until the young disperse in the fall; young owls, however, begin to hunt prey by late summer (Forsman et al. 1984).

Survivorship varies by age class (USDI Fish and Wildlife Service 1992a). Adults have the highest probability (81 to 96 percent) of surviving from one year to the next, followed by subadults and juveniles (7 to 31 percent). Mortality factors include predation, accident, and starvation. Common predators include the great horned owl, barred owls (*Strix varia*), and northern goshawk (*Accipiter gentilis*). Adults live an average of 8 years.

Diet
The northern spotted owl feeds on a variety of forest mammals, birds, and insects. From southern Oregon through northwestern California, the dusky-footed woodrat comprises the majority of prey biomass consumed by the northern spotted owl (Thomas et al. 1990).

Cover requirements

Cover requirements of the spotted owl vary. Forest stands must be open enough to allow owls to fly within and beneath the canopy (Thomas et al. 1990). Roosting and nesting habitats are typically comprised of moderate- to high-canopy closure to protect the spotted owl from weather or predators (USDI Fish and Wildlife Service 1992a).

Dispersal

USDI Fish and Wildlife Service (1992a) described dispersal of the northern spotted owl as follows. Spotted owls disperse to establish a new home range in another area. Juvenile spotted owls begin to disperse from natal areas in September and October. A distance of 9 to 30 miles is traveled during the first autumn. Patterns of juvenile dispersal vary in direction, distance, and survival. The average effective dispersal distance is greater for female juveniles (12 miles) than for males (4 miles).

Dispersal by adults is observed less because adult spotted owls normally form long and stable pair bonds. However, adult spotted owls may leave mates or move from one area to another. The reasons for these movements are unknown.

Thomas et al. (1990) described adequate dispersal conditions as landscapes in which 50 percent of the area was comprised of trees with an average dbh greater than 11 inches and with a canopy closure of at least 40 percent. USDI Fish and Wildlife Service (1992b) described dispersal habitat as stands with tree size and canopy closure adequate to provide protection from predators and at least minimal foraging opportunities.

Special habitat needs

Water is suspected as an important factor in habitat selection. Spotted owls in captivity and in the wild are observed to drink water and bathe (Forsman et al. 1984). Because spotted owls do not build their own nests, decadence (as measured by the presence of trees with broken tops and cavities, or snags) in forest stands may be required to provide suitable nest trees. Berbach et al. (Berbach et al. 1993) reported that over 75 percent of the quarter-townships in the coastal counties of Del Norte, Humboldt, and Mendocino exceeded this standard.

Current legal status

Listing history and current known listed range

The spotted owl was listed as a Federally threatened species on July 23, 1990 (USDI Fish and Wildlife Service 1990a). The northern spotted owl is Federally listed as a threatened species throughout its range in California, Oregon, and Washington. Relative to the recovery strategy of the northern spotted owl, PALCO lands are located within the California Coast Province, which contains all or portions of Del Norte, Humboldt, Mendocino, Trinity, Sonoma, Napa, and Marin Counties. Approximately 92 percent of the province is in non-Federal ownership (USDI Fish and Wildlife Service 1992a).

Reasons for listing
The primary reasons for listing the northern spotted owl were the loss of suitable habitat and the inadequacy of existing regulatory mechanisms (i.e., management plans for Federal lands) pertaining to timber harvest to ensure the long-term viability of the species.

Threats
The USDI Fish and Wildlife Service (1992a) summarized threats to the northern spotted owl to include the following: loss of habitat, limited habitat, declining populations, low populations, distribution of habitat or populations, isolation of populations, predation, competition, lack of coordinated conservation measures, and vulnerability to natural disturbances. These threats were rated according to the following scale:

Severe - Threat may cause province-wide population instability and/or decline.

Moderate - Threat is not severe at the present time but could become so within a few generations (i.e., within decades).

Low - Threat is not anticipated to cause significant adverse impacts on the province-wide population.

The USDI Fish and Wildlife Service (1992a) rated the above threats for the California Coast Province as follows:

Severe - Isolation of populations.

Moderate - Declining habitat, limited habitat, declining populations, and distribution of habitat.

Low - Low populations, predations, competition, and natural disturbances.

The USDI Fish and Wildlife Service (1992a) did not specifically rate conservation measures for the California Coast Province. Although USDA Forest Service and USDI Bureau of Land Management (1994) implemented a conservation strategy for the northern spotted owl on Federal lands in northwestern California, Federal lands subject to the conservation strategy are limited in the California Coast Province.

Hybridization with the barred owl may also pose a threat to the northern spotted owl throughout its range. The barred owl occurs in many parts of the northen spotted owl's range from Washington to northern California.

Conservation needs
The *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI Fish and Wildlife Service 1992a) serves as the basis for the following discussion, since Federal lands managed under the

Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management 1994) play a minor role in the California Coast Province. The conservation needs of the northern spotted owl focus on an adequate quantity, quality, and distribution of suitable habitat that contributes to the owl's breeding, feeding, cover, and dispersal requirements in a variety of ecological conditions.

Habitat conditions must be adequate on different geographic scales. On a local level, habitat should provide for clusters of 15 to 20 overlapping or nearly overlapping territories; larger, more closely situated clusters of owls have higher persistence rates than smaller, isolated clusters. Within clusters, stable or improving habitat conditions should be provided to counter the adverse effects of fragmentation. These adverse effects include reduced spotted owl density, decreased productivity, increased susceptibility to windthrow, decreased success of juvenile dispersal, and increased competition or predation. At a provincial level, habitat conditions should provide for an adequate number and distribution of populations. Provinces should not be isolated from each other. Habitat conditions and spacing between local populations must provide for survival (i.e., provide for requirements of breeding, feeding, roosting, and cover) and ensure movement of northern spotted owls. Conservation strategies should account for loss of suitable habitat due to natural disturbances (e.g., fire, windthrow, insects, and disease) at all landscape scales. Effective and coordinated conservation measures are needed on non-Federal lands in the California Coast Province.

The PALCO lands play a role in the conservation of the northern spotted owl on non-Federal lands in southern Humboldt County, California. The ownership contains habitat capable of supporting a cluster of greater than 20 pairs of owls as recommended by the final draft recovery plan. A cluster of owls this size would contribute to the overall size and reproduction of the spotted owl population in the province. In addition, the ownership also contributes adequate dispersal habitat to facilitate the movement and interchange of owls located on the property and on adjacent lands. The *Final Draft Recovery Northern Spotted Owl Recovery Plan* (USDI Fish and Wildlife Service 1992a) recommended that population clusters totaling 60 owl pairs be maintained in the southern Humboldt-northern Mendocino area.

Federal lands outside of the California Coast Province comprise a substantial portion (65 percent, 5,561,400 acres of 8,578,700 acres) of the northern spotted owl's range in California. Management direction and land allocations of the Northwest Forest Plan are expected to constitute the Forest Service and Bureau of Land Management contribution to the recovery of the northern spotted owl on Federal lands (USDA Forest Service and USDI Bureau of Land Management 1994).

Status and distribution

Species

Numbers

The *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI Fish and Wildlife Service 1992a) summarized the population status of the northern spotted owl as follows. Estimates of the historical population size are imprecise due to a lack of previous survey effort, as are estimates of the amount and distribution of suitable habitat. The population size and survival rate of adult owls have declined due to logging over the past 100 years (and mostly within the last 40 years) (USDA Forest Service and USDI Bureau of Land Management 1994).

Population size and density decrease along the northern, eastern, and southern portions of the owl's range. The majority of the owl population occurs in the eastern Oregon Cascades, western Oregon Cascades, Oregon Klamath, California Klamath, and California Coast provinces.

The ability of the northern spotted owl to resist habitat change probably varies as a function of ecological conditions (e.g., quantity, quality, and distribution of suitable habitat; recovery rate of habitat; type, abundance, and availability of prey base) in various portions of its range. Although strong evidence suggests owl populations have declined across substantial portions of the owl's range, the pattern in population change may not be identical everywhere (USDA Forest Service and USDI Bureau of Land Management 1994) HEREAFTER THIS REFERENCE ISN"T HIHGLIGHTED. Spatially explicit models of the relationship of population dynamics to habitat dynamics suggest that northern spotted owl populations can stabilize over the long-term, given a reduction in the amount of suitable habitat and numbers of spotted owls in the short-term (USDA Forest Service and USDI Bureau of Land Management 1994). A similar analysis for non-Federal lands is not completed to date.

Most (approximately 80 percent) owl pairs range-wide occur on Federally managed lands. Distribution of these pairs varies by land ownership, state, and physiographic province. Inventories are least complete in California; however, 40 percent of the State's population and habitat of spotted owls may occur in the California Coast province. The California Coast Province encompasses approximately 40 percent of the northern spotted owl range in California (USDI Fish and Wildlife Service 1992a).

Inventories from 1987 through 1991 (some areas included 1992 surveys) indicated that spotted owls were located at approximately 4,600 sites, including 3,602 pairs and 957 resident single owls (USDA Forest Service and USDI Bureau of Land Management 1994). The estimates covered various ownerships, including Federal, State, County, and private ownerships throughout the owl's range. Current estimates of population are undoubtedly underestimates, since all suitable habitat has not yet been surveyed. The percentage of spotted owl habitat surveyed for owls varied by state and ownership: Forest Service - Washington (40 percent), Oregon (73 percent), and California (44 percent); Bureau of Land Management - Oregon (61 percent) (data were not available for California; Washington was not applicable); and National Park Service, Olympic National Park, Washington (10 percent).

Gould (1995) reported that 978 northern spotted owl activity centers were known in the three California coastal counties of Del Norte, Humboldt, and Mendocino. Sixty-seven percent of these sites were on privately-owned timberlands that had been subject to timber management for decades.

Distribution
The northern spotted owl is currently distributed in varying densities and numbers in suitable habitat throughout its range in Washington, Oregon, and California. Fewer than 20 pairs have been reported to occur in British Columbia (USDI Fish and Wildlife Service 1992a).

Reproduction
A single analysis (meta-analysis) of all demographic data collected from 11 study areas located across much of the owl's range suggests a declining rate (range = 0.9162 to 0.9934; midpoint = 0.9548) of population growth (USDA Forest Service and USDI Bureau of Land Management 1994). A rate (lambda) equivalent to 1.0 indicates a stable (i.e., neither increasing or decreasing) population, and a rate in excess of 1.0 indicates an increasing population. Continued declines in the adult survival rate without offsetting increases in the number of young produced per female or in juvenile survival suggest that the population decline has accelerated. Significant geographic areas, including the California Coast and other provinces, were not included in the analysis. Patterns of population change differed by area: five short-term study areas exhibited a lower average population growth rate, compared to six long-term study areas. The decline in population growth was not significantly different from a rate of 1.0 in one (the Willow Creek area in northwestern California) of the long-term study areas.

Suitable habitat
Acreage
No precise estimate of the total amount of suitable northern spotted owl habitat exists. Current data largely represent estimates of suitable habitat found on Federal, State, County, or tribal lands within the range of the owl; data for all private lands in Washington, Oregon, and California are not available. Federal lands in the range of the northern spotted owl encompass approximately 20.6 million acres of forested habitat (USDA Forest Service and USDI Bureau of Land Management 1994). Of this total, about 7.8 million acres are considered suitable habitat (USDI Fish and Wildlife Service 1992a). About 8.3 million acres of suitable habitat are estimated to occur within the range of the northern spotted owl, given consideration to estimates for other ownerships (e.g., State, City, County, and Tribal) (USDI Fish and Wildlife Service 1992a).

Distribution
Suitable habitat is distributed in varying proportions throughout the range of the northern spotted owl. Gaps in the distribution of suitable habitat occur due to ecological conditions and human influences (e.g., timber harvest). No significant gaps are identified in northwestern California.

Quality
Quality of suitable habitat varies due to ecological conditions (e.g., forest structure, tree species composition, prey species composition, and fire), physiographic features (e.g., elevation and aspect), and human influences (e.g., timber harvest). Suitable habitat generally decreases in quality as elevation increases, in drier portions of the owl's range, or in areas with extensive forest fragmentation or habitat loss due to timber harvest. However, population of northern spotted owls exist in unusually high densities within extensively fragmented managed forests, apparently

in response to high prey populations and to rapid tree growth that facilitates the development of various structural characteristics of suitable habitat.

Bald Eagle

The status, distribution, and ecology of the bald eagle is summarized in the final rule to reclassify the bald eagle from endangered to threatened (USDI Fish and Wildlife Service 1995a) and the *Pacific Bald Eagle Recovery Plan* (USDI Fish and Wildlife Service 1986).

Species description

The bald eagle is a large, brown raptor with a white head and white tail. Young eagles are mostly brown until 4 to 6 years of age (USDI Fish and Wildlife Service 1995a).

Life history

Definition of suitable habitat

The bald eagle is typically associated with aquatic systems (e.g., rivers, large lakes, reservoirs, major rivers, and some coastal habitats). These aquatic areas must have an adequate food base, perching areas, and nest sites to support reproductive pairs. In winter, roost sites are chosen in areas close to water and with adequate perch trees (USDI Fish and Wildlife Service 1995).

The USDI Fish and Wildlife Service (1986) described nesting habitat as follows. Nests are located in the canopy of the larger live trees in forested stands that exhibit a multi-storied structure and contain an old-growth component. A variety of factors (e.g., tree characteristics and distances to water and disturbance) influence nest site selection. A variety of tree species are selected as nest sites. The distance of nests from water averaged 1,584 feet in California. Snags provide perch sites or access to nests.

Wintering habitat and communal roosts are further described by the USDI Fish and Wildlife Service (1986) as follows. Perch trees near water and with a view of the surrounding area apparently are important factors in site selection. A variety of tree species is used in wintering habitat. Isolation from disturbance is an important feature of wintering habitat.

Communal roosts differ from winter perch sites. Communal roosts are typically located near rich food sources and in uneven-aged forests stands containing an old-growth component; forest stands provide protection from inclement weather. Characteristics of roost trees and stands vary.

Reproduction

Eagles construct their own nests of sticks. Eagle pairs use the same territories each year and typically reuse the same nests. Alternate nests are constructed within territories; their use varies from year to year. One to three, typically two, eggs are laid. Pair bonding occurs early in the year (January) followed by egg-laying and incubation. Peak breeding activity is in March to June, with young birds leaving the nest in early summer. The critical period of the breeding season extends from January 1 to August 31.

Diet

The bald eagle's diet varies locally and seasonally. Fish, waterfowl, jackrabbits, and carrion comprise the most common food sources in the eagle's diet (USDI Fish and Wildlife Service 1986).

Cover requirements

Protection from inclement weather may be an important factor in the selection of wintering habitat.

Dispersal

All age classes (adult, subadult, and juvenile) of the bald eagle exhibit some form of movement (USDI Fish and Wildlife Service 1986). Dispersal of juveniles from nests is less defined than that of adults; juveniles wander substantially and disperse in various directions. Eagles breeding in the Pacific Recovery Area probably winter near their nests. Some adults and subadults wander substantial distances, settling in new areas during subsequent years.

Special habitat needs

The bald eagle has several special habitat needs, including isolation from disturbance, large trees with open crowns to support nests and provide access to nests, roost trees, and perch sites.

Current legal status

Listing history and current known listed range

The bald eagle was listed south of the 40th parallel as an endangered species on February 24, 1967 (USDI Fish and Wildlife Service 1967) under the Endangered Species Preservation Act of 1966. On February 14, 1978 (USDI Fish and Wildlife Service 1978), the bald eagle was listed as endangered throughout the lower 48 states, except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened. Survey results at the time indicated that population levels and reproductive success were lower throughout most of the lower 48 states. On August 11, 1995 (USDI Fish and Wildlife Service 1995a), the status of the bald eagle was reclassified as threatened throughout all of the lower 48 states due to continued improvement in population levels and reproductive success.

Population levels and reproductive success of the bald eagle have continued to improve throughout the lower 48 states since 1995, meeting or exceeding most recovery goals in many of the recovery zones. Current efforts are aimed at delisting the bald eagle in the near future.

PALCO lands are located in the Pacific Recovery Region which includes several states: California, Oregon, Washington, Nevada, Idaho, Montana, and Wyoming. In California, the ownership is located within Bald Eagle Management Zone 23, which includes all or portions of the following counties: Del Norte; Humboldt; Mendocino; Lake; Siskiyou; and Trinity.

Critical habitat has not been designated or proposed for the bald eagle.

Reasons for listing
The primary reason for listing the bald eagle was the adverse effect of DDT on the reproductive success of nesting eagles. DDT impaired the release of calcium needed for eggshell formation, resulting in thin eggshells and reproductive failure; the use of DDT in the United States was banned on December 31, 1972 (USDI Fish and Wildlife Service 1995a).

Threats
The following still pose threats to the bald eagle: loss of roosting, nesting, or foraging habitat due to development, logging, and other human activities; shooting; secondary lead poisoning; other environmental contaminants which may be present in the food chain; electrocution; and disturbance of nesting, roosting, or foraging birds due to human intrusion or activity (USDI Fish and Wildlife Service 1986).

Conservation needs
Bald eagles need adequate habitat conditions that meet their breeding, feeding, roosting, and wintering requirements. Isolation from disturbance also appears to be an important factor during the breeding season and at winter roosts.

PALCO lands play a minor role in the conservation of the bald eagle. No nest sites are known to occur on the ownership. The ownership, however, provides habitat conditions for a small number of wintering bald eagles. The recovery goals (e.g., number of nesting pairs, average reproduction rate, and stability of wintering population levels) have been met for the California/Oregon Coast Recovery Zone. Therefore, the PALCO lands are not considered essential to achieve the recovery goal for this recovery zone.

The Northwest Forest Plan is expected to benefit the recovery of the bald eagle on Federal lands by providing an increasing number of potential nest sites and an improved prey base (USDA Forest Service and USDI Bureau of Land Management 1994).

Status and distribution

Species

Numbers

The bald eagle population levels have increased in response to improved conditions in the environment. The following discussion is based data provided by the USDI Fish and Wildlife Service (1995a). Surveys of the lower 48 states documented a total of 417 pairs in 1963. Within approximately 20 years, bald eagles had increased in number to a total of 1,757 pairs in 1984. Ten years later in 1994, a total of 4,452 pairs were observed in the lower 48 states. Survey data from 1997 suggest the bald eagle population is still increasing: a total of at least 5,170 pairs were documented in the lower 48 states (R. Mesta, pers. comm., August 6, 1998; table 12).

Table 12. Status of the bald eagle by recovery region in the lower 48 States during 1997 (R. Mesta, pers. comm., August 6, 1998).

Recovery region	Number of pairs: Goal	Number of pairs: Observed	Reproductive rate[1]: Goal	Reproductive rate[1]: Observed
Pacific	759	1,359	1.0	1.1
Southwest	-[2]	-[2]	-[3]	-[3]
Northern	1,200	2,063	1.0	1.2
Southeastern	600	1,259	0.9	1.3
Chesapeake Bay	300-400	489	1.1	>1.1

[1] Reproductive rate is defined as the number of young fledged per pair.

[2] Goal was not expressed as number of pairs. Instead, the goal was to have the population expand into one additional river drainage. In 1997, bald eagles were observed to have expanded into three additional river drainages.

[3] Goal was not expressed as number of young fledged per pair. Instead, the goal was to have 10-12 young produced over a 5-year period. In 1997, bald eagles were observed to have produced more than 10 young each year since 1981.

Distribution

The bald eagle is generally well-distributed throughout its range. Some gaps in its distribution occur as a result of ecological conditions.

Reproduction

Results of surveys to date suggest an increasing trend in the reproduction rate of the bald eagle throughout the lower 48 states. In 1997, The average rate of reproduction was estimated at 1.11 young fledged per pair with 70 percent of the pairs being successful (R. Mesta, pers. comm., August 6, 1998). These rates exceeded the recovery goals of 1.0 and 65 percent, respectively. Reproductive success was based on a 5-year average for the period 1993-1997.

Suitable habitat

Acreage, distribution, and quality

Data on the quantity, quality, and distribution of suitable habitat throughout the range of the bald eagle could not be compiled for the purpose of this consultation.

Marbled murrelet

Species Description

Accounts of the taxonomy, ecology, and reproductive characteristics of the marbled murrelet are found in the following publications: *Ecology and Conservation of the Marbled Murrelet* (Ralph et al. 1995), the *Final Recovery Plan Marbled Murrelet (Brachyramphus marmoratus) Washington, Oregon, and California Populations* (Recovery Plan) (USDI Fish and Wildlife Service 1997), the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-successional and Old-growth Forest Related Species Within the Range of the*

Northern Spotted Owl (FSEIS) (USDA Forest Service and USDI Bureau of Land Management 1994), the *Status of the Marbled Murrelet in North America: with Special Emphasis on Populations in California, Oregon, and Washington* (Marshall 1988), and in Nelson (1997).

Life history

Definition of suitable habitat

Marbled murrelets generally nest in old-growth forests, characterized by large trees, multiple canopy layers, and moderate to high canopy closure. These forests are located close enough to the marine environment for the birds to fly to and from the nest sites. The furthest known inland occupied site is 52 miles in Washington.

General landscape condition may influence the degree to which marbled murrelets nest in an area. In Washington, detections of murrelets increased when old-growth/mature forests comprised more than 30 percent of the landscape. Raphael et al. (1995) found that the percentage of old-growth forest and large sawtimber was significantly greater within 0.5 mile of sites that were occupied by murrelets than at sites where they were not detected. Raphael et al. (1995) suggested tentative guidelines based on this analysis that sites with 35 percent old-growth and large sawtimber in the landscape are more likely to be occupied. In California, Miller and Ralph (1995) found that the density of old-growth cover and the presence of coastal redwood were the strongest predictors of presence.

Relatively few nests have been located due to the species' small body size, cryptic plumage, crepuscular activity, fast flight speed, solitary nesting behavior, and secretive behavior near nests (Hamer and Nelson 1995). Potential nest trees are generally more than 32 inches dbh with the presence of large branches, deformities, or other formations providing platforms of sufficient size to support adult birds; the average nest tree diameter was 63 inches. The Recovery Plan (USDI Fish and Wildlife Service 1997) summarizes information on 136 known nest trees in North America. The most common tree species used for nests in the Pacific Northwest and British Columbia was Douglas-fir. Nest sites in Oregon and Washington were located in stands dominated by Douglas-fir, western hemlock, and Sitka spruce. California nest sites have been located in stands containing old-growth redwood and Douglas-fir. Hamer and Nelson (1995) summarized characteristics of 10 nest trees in California including 3 trees on PALCO lands. Four of the nest trees were Douglas-fir, one western hemlock, and five coastal redwood. In central and northern California, all nest sites had a higher percentage of redwood trees than Douglas-fir (Hamer and Nelson 1995). The average nest stand size was 509 acres, with stands ranging in size from 7 to 2,718 acres.

Most nests were located on large or deformed, moss covered branches; however, a few nests were located on smaller branches, and some nests were situated on duff platforms composed of conifer needles or sticks rather than moss. The diameter of nest branches, measured at the tree trunk, averaged 11 inches and ranged from 4 to 25 inches. Nests were typically located in the top third of the dominant tree canopy layer and usually had good overhead protection. Such locations seem to allow easy access to the exterior of the forest and provide shelter from potential predators (Nelson 1997). Overhead protection for the nest was provided by overhanging branches, limbs above the nest area, or branches from neighboring trees. In most cases, canopy closure directly above the nest was high, averaging 84 percent.

Murrelets appear able to nest in a variety of unmanaged (i.e., unentered old-growth) and previously altered (i.e., previously harvested or burned) stands if certain habitat characteristics are present. Potential nesting areas may contain fewer than one suitable nesting tree per acre (USDI Fish and Wildlife Service 1996a), and nests have been found in remnant old-growth trees in mature forests in Oregon (USDI Fish and Wildlife Service 1996a). Murrelets are known to nest in stands containing residual old-growth trees on PALCO lands.

Reproduction

Life history information is lacking for the marbled murrelet (USDI Fish and Wildlife Service 1997). However, murrelets probably do not reach sexual maturity until their second year, and most birds probably do not lay eggs until they are 3 years of age or older (USDI Fish and Wildlife Service 1997). Marbled murrelets produce one egg per nest and likely only nest once a year. Nests are not built, but rather the egg is placed in a small depression or cup made in moss or other debris on the limb (USDI Fish and Wildlife Service 1997). In California, egg-laying and incubation span a long period, beginning March 24 and ending August 25, with the nestling period beginning April 23 and ending September 9 (Hamer and Nelson 1995).

Incubation lasts about 30 days, and chicks fledge after about 28 days after hatching. Both sexes incubate the egg in alternating 24-hour shifts. The chick is fed up to eight times daily, and is usually fed only one fish at a time. Adults fly from the ocean to inland nest sites at all times of the day, but most often at dusk and dawn. The young are semiprecocial. Fledglings appear to fly directly from the nest to the ocean, but are sometimes found on the ground, indicating that they may have been unable to sustain flight to reach the marine environment (USDI Fish and Wildlife Service 1997).

Diet

Marbled murrelets are diving seabirds that feed on a wide variety of small fish and invertebrates in near-shore marine waters (mainly within one mile from shore) (USDI Fish and Wildlife Service 1997). Generally they are opportunistic feeders and can exhibit major changes in prey consumption in response to changes in the marine environment. However, adults, subadults, and hatch-year birds feed primarily on larval and juvenile fish, whereas nestlings are most commonly fed larger second-year fish. This restriction forces adults that are feeding chicks to exercise more specific foraging strategies to locate these large fish, focusing on species that are less abundant and distributed differently than adult prey.

Cover requirements

It is believed that successful murrelet nesting requires relatively high levels of horizontal and vertical cover to provide protection from predators (Nelson 1997). Overall canopy closure of most stands were nests were found was moderate to high, averaging 48 percent for 45 nest sites (range 12 to 99 percent) reported by Hamer and Nelson (1995). Canopy closure at 10 stands in California where nests were discovered ranged from 25 to 48 percent and averaged 39 percent (Hamer and Nelson 1995). Cover directly over the nests averaged 84 percent and was provided by adjacent trees or the nest tree itself.

On a landscape basis, forests with a canopy height of at least one-half the site-potential tree height in proximity to potential nest trees are likely to contribute to the conservation of the marbled murrelet. These forests may reduce the differences in microclimate associated with forested and unforested areas, reduce potential for windthrow, and provide a landscape that has a higher probability of occupancy by murrelets (USDI Fish and Wildlife Service 1997).

Site Fidelity and Dispersal

Marbled murrelets, like many alcids, display a high level of site fidelity (Nelson 1997). The tendency to return each season to the same nest site or breeding colony is known as "site fidelity," "site tenacity," or "philopatry." This phenomenon is common in many, and perhaps the majority, of birds. The prevalence of this trait in so many bird species strongly suggests that the behavior confers distinct survival advantages. Scarcity of suitable nest sites may promote site tenacity, but one major advantage of returning to an established breeding site is that familiarity with the site may result in a reduced susceptibility to predation and other adverse conditions (Ehrlich et al. 1988). These and other advantages are so pronounced that many birds imprint on their nesting territories as young chicks and return to them when they are old enough to breed.

Such advantages are important for alcid seabirds (Family Alcidae), most of which exhibit very strong nest site fidelity. The vast majority of individual seabirds return every year to the exact same nest sites within a colony (Nettleship and Birkhead 1985, Kress and Nettleship 1988, Ehrlich et al. 1988). A small percentage of individual seabirds sometimes change nest sites between years, usually due to the death of a mate or failure to successfully fledge young. In addition to adults returning every year to the same nest site, most young seabirds return to breed for the first time at or very close to the nesting areas where they were reared (Nettleship and Birkhead 1985). Repeated use of a nest site is a behavioral property of an individual bird, but specific nest sites may be used over time by successive generations of individuals for a variety of reasons that are inherent properties of the site (Ehrlich et al. 1988). Such properties include physical stability, protection from predators, and proximity to a reliable food source. This phenomenon tends to compound the value of high quality nesting areas.

Scientific information on the breeding behavior of the marbled murrelet is very difficult to collect because the species is secretive during the nesting season, but behavior at known murrelet nest sites suggest that murrelets have high fidelity to specific nesting areas or forest stands (Nelson 1997). The capacity for displaced breeding adults to colonize new territory is unknown and probably low. Immature birds may colonize new areas more readily than established adults, especially if the natal breeding area is fully occupied or eliminated (e.g., due to harvest or fire), and murrelets are capable moving relatively long distances in short periods of time. The Recovery

Plan summarizes the need for further research on the dispersal of juveniles, nest site fidelity, and colonization of unoccupied habitat (USDI Fish and Wildlife Service 1997).

Special habitat needs

To successfully reproduce, marbled murrelets need sufficient numbers of suitable nesting platforms located in forests proximal to adequate food supplies in the marine environment. Suitable nesting platforms include considerations of protection from climate fluctuations and predation at local and landscape scales.

Current legal status

Listing history

The marbled murrelet was Federally listed as a threatened species in Washington, Oregon and California on September 28, 1992 (USDI Fish and Wildlife Service 1992b). The draft recovery plan was released on August 1, 1995 and the final recovery plan was released in 1997 (USDI Fish and Wildlife Service 1997).

Current known listed range

The Washington, Oregon, and California population segment of the marbled murrelet is listed as threatened (USDI Fish and Wildlife Service 1992b). The species is state listed as endangered in California and as threatened in Oregon and Washington (USDI Fish and Wildlife Service 1997).

Reasons for listing

The marbled murrelet was listed due to the loss and modification of nesting habitat primarily due to commercial timber harvesting (USDI Fish and Wildlife Service 1992b). The major factors in the marbled murrelet population decline from historical levels in the early 1800's are loss of nesting habitat and poor reproductive success in the habitat that remains (USDI Fish and Wildlife Service 1997).

Threats

In addition to removal and degradation of nesting habitat, the following are known threats: gill-net fishing operations, oil spills, marine pollution, and changes in prey abundances and distribution (USDI Fish and Wildlife Service 1997). Murrelets have a high vulnerability to oiling, and oil spills have had catastrophic effects when they have occurred in the vicinity of murrelet concentrations (USDI Fish and Wildlife Service 1996a).

Conservation needs

The recovery objectives of the Recovery Plan (USDI Fish and Wildlife Service 1997) are: (1) stabilize and then increase population size, changing the current downward trend to an upward trend throughout the listed range; (2) provide conditions in the future that allow for a reasonable likelihood of continued existence of viable populations; and (3) gather the necessary information to develop specific delisting criteria. The Recovery Plan identifies stabilizing and increasing habitat quality and quantity on land and at sea as the key means to stopping population decline and encouraging future population growth.

The Recovery Plan (pages 138 to142) recommends implementing the following short-term actions to stabilize and increase the population: (1) maintain all occupied nesting habitat on Federal lands administered under the Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management 1994); (2) on non-Federal lands, maintain as much occupied habitat as possible and use the HCP process to avoid or reduce the loss of this habitat; (2) maintain potential and suitable habitat in large contiguous blocks; (3) maintain and enhance buffer habitat surrounding occupied habitat; (4) decrease adult and juvenile mortality; and (5) minimize nest disturbances to increase reproductive success.

The Recovery Plan (pages. 142-146) also recommends implementing the following long-term actions to stop population decline and increase population growth: (1) increase the amount and quality of suitable nesting habitat; (2) decrease fragmentation by increasing the size of suitable stands; (3) protect "recruitment" nesting habitat to buffer and enlarge existing stands, reduce fragmentation, and provide replacement habitat for current suitable nesting habitat lost to disturbance events; (4) increase speed of development of new habitat; and (5) improve and develop north/south and east/west distribution of nesting habitat.

The Recovery Plan identifies six Marbled Murrelet Conservation Zones throughout the listed range. These are the Puget Sound Conservation Zone (Zone 1); Western Washington Coast Range Conservation Zone (Zone 2); Oregon Coast Range Conservation Zone (Zone 3); Siskiyou Coast Range Conservation Zone (Zone 4), Mendocino Conservation Zone (Zone 5); and Santa Cruz Mountains Conservation Zone (Zone 6). The Recovery Plan suggests more specific conservation management plans be developed for each of the zones. To allow for the long-term survival and recovery of the murrelet, Zones 1 to 4 must be managed to produce and maintain viable populations that are well distributed throughout the respective zones.

The Siskiyou Coast Range Zone (Zone 4) extends from North Bend, Coos County, Oregon, south to the southern end of Humboldt County, California. This Zone includes known marbled murrelet populations in National and State Parks and PALCO lands and large blocks of suitable habitat critical to the three-state population recovery over the next 100 years (USDI Fish and Wildlife Service 1997, page 128). The amount of suitable habitat protected in parks is probably not sufficient by itself to guarantee long-term survival in this Zone, and the Recovery Plan identifies private lands at the southern end of the Zone as important for maintaining the current distribution of the species. There is already a considerable gap (300 miles) in distribution between this area and the central California population in Zone 6, and the Recovery Plan recommends avoiding the expansion the current distribution gap. The Recovery Plan recommends that actions in Zone 4 should focus on preventing the loss of occupied nesting habitat, minimizing the loss of unoccupied but suitable habitat, and decreasing the time for development of new suitable habitat.

Guidance in the Recovery Plan suggests that maintenance of marbled murrelet populations on private lands is critical in arresting the decline of the species in the next 50 to 100 years. This is especially true where additional nesting habitat is not expected to be available on nearby Federal lands. The demographic bottleneck that the murrelet population may experience during the next

50-100 years makes the maintenance of populations found on non-Federal lands an important component to improve viability and the likelihood for eventual recovery. On non-Federal lands the maintenance of all occupied sites should be the goal where possible.

However, the Recovery Plan (page 139) recognized that through the HCP process there may be some limited loss of occupied sites or unsurveyed suitable habitat, and that HCPs offer the best means for conservation of the species on non-Federal lands if take is minimized and mitigated and long term maintenance or creation of habitat is achieved (page 133). In the short-term (the next 5 to10 years), until additional information is obtained, loss of any occupied sites or unsurveyed suitable habitat should be avoided or the potential impacts significantly reduced through a habitat evaluation process outlined in the SYP/HCP. Short-term trade-offs for long-term benefits should be evaluated very carefully at this early stage of marbled murrelet recovery.

The Recovery Plan identifies PALCO lands as supporting essential nesting habitat under non-Federal management. It recognizes these areas as representing a significant portion of the currently available nesting habitat for the southern part of Zone 4. This area has known nest sites and is situated in a key area, close to the coast, with no Federal lands in the immediate area that are able to provide similar recovery contributions. Maintenance of suitable habitat in this area is also critical to avoid widening the gap between the central California population and southern end of Humboldt County.

Status and distribution

Range-wide (listed population)

Species

Numbers

The size of the listed population in Washington, Oregon, and California has been estimated at 18,550 to 32,000 birds (Ralph et al. 1995, Nelson 1997). The large range in the population estimate is a result of two widely divergent population estimates in Oregon. Varoujean and Williams (1995) used aerial surveys conducted along the entire Oregon coast in August and September 1993, to estimate that 6,600 murrelets occur in Oregon. Strong et al. (1995) used boat surveys to estimate that 15,000 to 20,000 murrelets occur in Oregon.

The most recent estimates of numbers in Washington (Speich and Wahl 1995) indicate a breeding population of approximately 5,500 birds. In Washington, marbled murrelets are considered only locally common during some times of the year. Puget Sound and the northern part of the outer coast are heavily used during the breeding season. The southern portion of the outer coast potentially plays an important role as a wintering area. In addition, there seems to be seasonal movements of murrelets into Puget Sound from British Columbia in the winter.

Ralph and Miller (1995) conducted intensive at-sea surveys in small portions of the murrelets's range in northern California from 1989 to 1993. These multi-year surveys, specifically designed to estimate population size in California, used different methods and assumptions and estimate a total state population of approximately 6,000 breeding and non-breeding birds. Similar to Strong in Oregon, Ralph and Miller (1995) extrapolated results from small areas to estimate numbers of murrelets over much larger areas. Swartzman et al. (1997, page 12) used some of this data to estimate approximately 4,134 murrelets are in northern California. Becker et al. (1997) and Ralph et al. (1995) discuss some of the methodological problems with surveying for murrelets at sea.

The Recovery Team (USDI Fish and Wildlife Service 1997, Appendix B) constructed a demographic model of the murrelet and concluded that the population may be declining at rates of 4 to7 percent per year range-wide, but this estimate is hampered by the possibility that the age-ratio data used in the model are reflective of a relatively temporary decline due to unusual ocean conditions (Ralph et al. 1995). Ralph et al. (1995) summarized some of the reasons for variability in population estimates among researchers, including differences in methodology, assumptions, spatial coverage, and survey and model errors. Nevertheless, both Ralph et al. (1995) and the Marbled Murrelet Recovery Team (USDI Fish and Wildlife Service 1997) have concluded that the listed population appears to be in a long-term downward trend.

Distribution
The distribution of marbled murrelet populations has been significantly reduced as habitat has been removed and populations have declined. Several areas of concern have been identified where only small numbers of murrelets persist or where they have been locally extirpated (USDI Fish and Wildlife Service 1997). These areas include distribution gaps in central California, northwestern Oregon, and southwestern Washington.

The historic distribution of the marbled murrelet within the listed range is believed to have been relatively continuous in near shore waters and in coniferous forests near the coast from the Canadian border south to Monterey County, California (USDI Fish and Wildlife Service 1997). Current breeding populations are discontinuous and generally concentrated at sea in areas adjacent to remaining late successional coniferous forests near the coast (Nelson 1997). At-sea observations of murrelets are rare between the Olympic Peninsula in Washington and Tillamook County in Oregon, a gap of approximately 100 miles. Off the California coast, marbled murrelets are concentrated in two areas at sea that correspond to the three largest remaining blocks of older, coastal forest. These forest blocks are separated by areas of little or no habitat, which correspond to locations at sea where few marbled murrelets are found. A 300-mile gap occurs in the southern portion of the marbled murrelet's breeding range, between Humboldt and Del Norte counties in the north and San Mateo and Santa Cruz counties to the south. Marbled murrelets likely occurred in this gap prior to extensive logging of redwood forests (USDI Fish and Wildlife Service 1997).

Reproduction
As summarized in the Recovery Plan, marbled murrelet populations in California, Oregon, and Washington may be declining at a rate of 4 to 7 percent per year at most locations. The murrelet has a low annual reproductive potential because it only lays one egg and probably nests once a year (Nelson 1997). Recent estimates of nesting success and recruitment suggest that productivity is below levels required to sustain the listed population (Beissinger 1995). Even if the

reproductive potential was fully realized over several years, the population will recover slowly (about 3 percent per year) from declines or disasters. Low productivity likely reflects poor breeding success, although to a lesser extent it could also reflect the development of a larger than normal nonbreeding segment of the population. There is little opportunity for increases in murrelet productivity as a result of forest in-growth in the near future because it takes hundreds of years for suitable habitat to develop. However, habitat conditions in some areas could be improved in shorter time periods with active stand management where large residual trees are present (USDI Fish and Wildlife Service 1997).

Suitable habitat

Acreage

Suitable habitat has declined throughout the range of the marbled murrelet as a result of commercial timber harvest, with some loss attributable to natural disturbance such as fire and windthrow. Timber harvest has eliminated most suitable habitat on private lands within the three state area (USDI Fish and Wildlife Service 1997). In the early to mid-1800s, Western Washington and Oregon are estimated to have been covered with 14 to 20 million acres of old-growth forests, while as of 1991 about 3.4 million acres of old-growth forests remained. This loss represents an approximate 82 percent reduction from amounts prior to logging (USDI Fish and Wildlife Service 1997). Estimates for northwestern California for this same time period suggest there were between 1.3 million and 3.2 million acres of old-growth Douglas-fir/mixed conifer forest. According to the final EIS/EIR, old-growth redwood forest covered approximately 2.7 million acres prior to 1850.

As of 1997, there were an estimated 1,077 known occupied murrelet sites within Washington, Oregon, and California (L. Reigel, USDI Fish and Wildlife Service GIS technician, pers. comm., 1997). The total number of acres of suitable habitat in these three states is unknown. Currently, suitable habitat for the murrelet is estimated at 2,561,500 acres on Federal lands in the listed range of this species (Ralph et al. 1995). Murrelet habitat is protected on Federal land under the Northwest Forest Plan in that no new timber sales will be planned in forested stands known to be occupied by murrelets regardless of whether these stands occur in reserves, adaptive management areas, or matrix areas (USDA Forest Service and USDI Bureau of Land Management 1994). In addition, the system of Federal reserves will not only protect habitat currently suitable to murrelets, but also develop future habitat in larger blocks. Currently there are approximately 56,000 acres of old-growth redwood forest estimated remaining in California, representing approximately 2.5 percent of the original old-growth redwood forest. More detailed descriptions of suitable habitat in the listed range are given in Nelson (1997) and USDI Fish and Wildlife Service (1997) and are incorporated herein by reference.

Likely Occupied Habitat in the Listed Range: Table 13 shows current estimates of the potentially occupied habitat within the listed range of the species. Because a large portion of identified suitable habitat may in fact not be occupied by marbled murrelets and is likely to overestimate the amount of actual murrelet habitat (Perry 1995), the FWS defined occupied habitat as that portion of potentially suitable habitat that is known or expected to be occupied with nesting murrelets, per the criteria in the Pacific Seabird Group survey protocol (Ralph et al. 1994). For example, although almost 200,000 acres of old-growth or late seral Douglas-fir forests remain and are protected on USDA Forest Service land in California, this suitable murrelet habitat occurs at distances further from the coast than the action area. Much of this habitat has been surveyed in recent years and does not contain or provide for murrelets in any significant numbers (Hunter et al. 1998); therefore it is not considered likely to be occupied. These estimates are based on existing survey data and assumptions about areas that have not been surveyed adequately. Where published data were lacking, the FWS solicited professional judgements from local biologists and considers these simple estimates to be the best available information.

Likely Occupied Habitat in Recovery Zone 4: The FWS estimates there are approximately 130,638 acres of likely occupied habitat in Marbled Murrelet Recovery Zone 4. Much of this habitat varies in quality, with good quality habitat in the unentered redwood forest and lower quality habitat in the managed Douglas fir forest in the northern part of Zone 4. There is significantly greater amounts of potentially suitable habitat than the estimated 130,638 acres of occupied habitat, but much of this habitat may not be occupied by murrelets and could be an artifact of our inability to accurately classify murrelet habitat at landscape scales. Comparisons or analyses using the larger amount of suitable habitat may underestimate the potential impacts of the proposed action and therefore are not used in this analysis .

Likely Occupied Habitat in the Southern Humboldt Bioregion: Survey efforts in HRSP and GCSP have identified approximately 6,930 acres of known occupied old-growth residual redwood in HRSP and 388 acres in GCSP (updated information provided by T. Reid, December 16, 1998). Most known occupied stands in HRSP are located in the lowland portions of the park along Bull Creek or other streams, while most surveys in the upland areas of HRSP have not detected occupied behaviors. However, most of the stations have not been surveyed to levels similar to stations on PALCO lands, and it is likely that some of this incompletely surveyed land is occupied by nesting murrelets at lower levels than is the high quality habitat in the lowlands.

Similar to the estimation of occupied habitat in unsurveyed Douglas fir habitat on PALCO lands, the FWS used an occupancy index of 0.05 and applied this to 16,246 acres of inadequately surveyed old-growth redwood/Douglas fir forest in HRSP. Although much of this unsurveyed habitat is redwood-dominant, it is also drier and not of similar quality to the redwood residual on PALCO lands (K. Moore, pers. comm.); preliminary surveys in this habitat had low numbers of detections. Using this calculation method, the FWS estimates that about 817 acres of the 16,346 acres is likely occupied. This 817 acres can be added to the known occupied 6,930 acres for an estimated total of 7,747 occupied acres in HRSP. The FWS acknowledges that this figure is likely an underestimate of potential occupied habitat in HRSP, but this conservative conclusion is justified given available information. Ralph et al. (Section IV, draft SYP/HCP,) attributed greater relative conservation value to HRSP lands, but the FWS believes their calculation methods may have overestimated HRSP usage by murrelets. Additional information on HRSP habitat quality and occupancy levels will further clarify this issue, and the implications of this estimate will be further discussed in the section on Effects of the Action.

Distribution
The Recovery Plan (USDI Fish and Wildlife Service 1997) summarizes the current distribution of suitable habitat and is incorporated herein by reference. Currently, breeding populations of murrelets are not distributed continuously throughout the forested portions of Washington, Oregon, and California. A gap of 100 miles in the north/south distribution of suitable habitat exists in southwestern Washington and northwestern Oregon and a north/south gap of 300 miles exists in central California in the southernmost portion of the species' range. These gaps consist of areas of second-growth and remnant older forests used by murrelets at low levels. The inland distribution of the species is greatest in Washington at approximately 55 miles from the marine environment, narrowing down in Oregon and even further in California to 10 to15 miles from the coast.

Quality
The overall quality of existing marbled murrelet habitat is diminished compared to habitat quality prior to logging (USDI Fish and Wildlife Service 1997). Total habitat area is greatly reduced, and remaining habitat is often fragmented and further from the marine environment. Quality varies across the range, with some excellent old-growth habitat remaining on Federal lands in each of the three states. However, much suitable habitat throughout the range is now lower quality than existed historically, with smaller trees, more roads and clearcut openings, and a greater abundance of predators. Small islands of habitat within a matrix of younger forests provide important habitat; however, they are often considered lower quality because of the vulnerability to wildfire, windthrow and perhaps a higher abundance of avian predators. Although ongoing research should shed more light on the specific factors that affect marbled murrelet nest predation and stand size preferences, the best available information strongly suggests that marbled murrelet reproductive success may be adversely affected by forest fragmentation associated with certain land management practices (USDI Fish and Wildlife Service 1997).

PALCO lands appear to have higher murrelet detection levels relative to other lands in the Southern Humboldt Bioregion (Bioregion) and Zone 4, suggesting that redwood residuals on PALCO lands may support more murrelets than habitats on nearby USFS and BLM further inland or in areas lacking a strong redwood component.

Table 13. Estimates of the acreage of potentially occupied marbled murrelet nesting habitat at various landscape scales within the species' listed range (adapted and updated from Table N1-2, EIS).

Region/Unit	Acres
Pacific Lumber Company Lands 1/	
Headwaters/Elk Head Springs	3,117
Other High Quality 2/	2,022
Low/Moderate Quality 3/	8,419
TOTAL	**13,558**
Southern Humboldt Bioregion (Bioregion)	
Pacific Lumber	13,558
Humboldt Redwoods State Park 4/	7,747
Grizzly Creek State Park 5/	388
TOTAL	**21,693**
Marbled Murrelet Conservation Zone 4 (MMCZ4) 6/	
Bioregion	21,693
Simpson	608
Stimson	91
Yurok	250
Six Rivers National Forest	3,719
Arcata BLM	568
Redwood National and State Parks	38,982
Oregon	64,727
TOTAL	**130,638**
California 7/	
MMCZ4(CA)	65,911
MMCZ5	430
MMCZ6	7,250
TOTAL	**73,591**
3 State (Washington, Oregon and California) 8/	
WA 9/	373,875
OR 9/	254,869
CA	73,591
TOTAL	**702,335**

1/ Habitat estimation method on PALCO lands: contiguous occupied old growth/residual habitat within 0.5-mile radius of occupied survey stations on PALCO lands (excluding Headwaters).

2/ High quality indicates unentered old growth redwood outside Headwaters; assumes remaining inadequately surveyed is 100% occupied.

3/ Low/moderate quality indicates residual redwood and inland Douglas-fir; assumes remaining inadequately surveyed is 5-63% occupied, depending on habitat type.

4/ Habitat estimation method in HRSP: contiguous occupied old growth/residual habitat within 0.5-mile radius of occupied survey stations, as estimated by CDFG, Palco, and USDI Fish and Wildlife Service, is 6,930 ac. Total estimate assumes remaining inadequately surveyed habitat is 5% occupied : (23276 - 6930)(.05) = 817; 817 + 6930 = 7747. (T. Reid, pers. comm., 12/16/98); this figure is likely an underestimate - see text.

5/ Includes all uncut old-growth within the state park

6/ Habitat estimation method in MMCZ4: Bioregion total plus estimates made for lands listed; estimates based on draft HCPs and personal communications with local biologists (OR total explained below)

7/ Habitat estimation method in California: MMCZ4 minus Oregon habitat plus totals for MMCZ5 and MMCZ6. MMCZ5 and MMCZ6 estimates based on L. Roberts, E. Burkett, pers. comm.

8/ WA = 1.5 million potential suitable acres (T. Young, pers. comm.) x 0.25 occupancy index (WDNR HCP, T. Hamer, pers. comm.) excluding 1,125 acres for Quinalt

OR = 2 conservation zones, MMCZ3 and MMCZ4 (Total = 254, 869 likely occupied acres)

MMCZ4 = (1) 20,000 acres, Siskiyou National Forest, Rogue National Forest, and Medford BLM
(USFS GIS, 80,000 acres x 0.25 occupancy index; index derived from Dillingham et al. (1995), Meyers pers. comm., ODFW marbled murrelet survey database, and S. Livingston, pers. comm.)

(2) 44,727 acres in Coos Bay BLM (J. Heaney, pers. comm.)
MMCZ3 = (1) 137,500 acres, Suislaw National Forest (C. Frounfelker, pers. comm.)
(2) 5,567 acres, Eugene BLM (D. Huber, pers. comm.)
(3) 30,075 acres, Coos Bay BLM (J. Heaney, pers. comm.)
(4) 4,000 acres, northwest Oregon (N. Bentivoglio, pers. comm.)
(5) 13,000 acres, Elliott State Forest HCP
(6) Private lands unknown but likely very small amount

9/ Habitat in Oregon and Washington may have lower murrelet densities than redwood forests, as indicated by detection levels.

Other completed or contemporaneous actions

The listing decision (USDI Fish and Wildlife Service 1992b), designation of critical habitat (USDI Fish and Wildlife Service 1996a), final Recovery Plan (USDI Fish and Wildlife Service 1997), Ralph et al. (1995), and Nelson (1997) discuss other threats to the survival and recovery of the murrelet and are incorporated herein by reference. Marine pollution, catastrophic weather events, and fire continue to pose a risk to the long term survival and recovery of the species. Some recent events, such as the death of at least nine murrelets due to an oil spill in Humboldt Bay, underscore the persistence of these other threats.

Murrelet conservation strategy and other murrelet HCPs: Before evaluating the effects of the proposed HCP on the marbled murrelet, it is necessary to review the overall Federal conservation strategy for the murrelet throughout its listed range. As described earlier in this section, the listed murrelet population may be declining at an annual rate of 4-7 percent (USDI Fish and Wildlife Service 1997). This modeled decline is most likely due to a reduction in nesting habitat that resulted from large scale timber harvest during the last 150 years, although other landscape and marine factors also likely played a role. The Northwest Forest Plan (Forest Plan) was implemented in 1994 to address and rectify this habitat loss on Federal lands and to promote recovery of the marbled murrelet, northern spotted owl, and other species dependent on late-successional forests (USDA Forest Service and USDI Bureau of Land Management 1994). In the biological opinion on the Forest Plan, the FWS concluded that the Forest Plan "should provide for the survival of a marbled murrelet population that is well distributed on Federal lands throughout the planning area" (USDA Forest Service and USDI Bureau of Land Management 1994, Appendix G, page 28). A similar conclusion was reached for the northern spotted owl.

Although the marbled murrelet and the northern spotted owl are different in many important biological respects, as co-inhabitants of much of the same late-successional forest they have experienced some of the same adverse effects of past land management practices. The best available science suggests that both species are experiencing a downward trend in population numbers due to past timber harvest (USDA Forest Service and USDI Bureau of Land Management 1994). Likewise, the overall land management strategy for the two species is similar: Conserve much of the remaining suitable or occupied habitat on Federal lands (and, in certain key areas on non-Federal lands for the murrelet) to provide a system of long term management reserves that will stabilize and eventually recover the declining population. This approach assumes the respective populations have not already declined below an extinction threshold from which they can not recover (USDA Forest Service and USDI Bureau of Land

Management 1994), and that the species will respond positively to a long term reversal in the trend of habitat loss (Raphael et al. 1996). Our technical ability to predict such potential thresholds for murrelets, spotted owls, and many other listed species is still quite crude (National Research Council 1995, page 168); in particular, our ability to estimate murrelet population size and trends is limited (Becker et al. 1997, page 744).

A conservative approach to managing murrelet habitat has been adopted by the Federal agencies that accommodates this inability to identify an extinction threshold. The Forest Plan is designed to enable Federal lands to bear most of the burden for recovering and maintaining late-successional species such as the murrelet. The Plan protects approximately 90 percent of the suitable murrelet habitat on Federal lands (USDI Fish and Wildlife Service 1997), and it places a total prohibition on the loss of occupied murrelet habitat on Federal lands. This prohibition includes a restriction on harvest of occupied sites in so-called "matrix" lands where timber harvest is otherwise allowed.

The Forest Plan and the Marbled Murrelet Recovery Plan (USDI Fish and Wildlife Service 1997) also identified the need for some non-Federal lands to contribute to murrelet recovery where distributional gaps occurred (FEMAT 1993, page IV-164), including the general area of PALCO ownership. It was recognized that some removal of occupied habitat is likely — and potentially permissible — on non-Federal lands assuming enough high quality habitat is protected to maintain well distributed, viable subpopulations throughout the listed range. In cooperating with non-Federal landowners who are developing murrelet HCPs in these important conservation areas, the FWS has followed this recommendation of the Marbled Murrelet Recovery Plan: minimize the loss of occupied murrelet habitat by evaluating and ranking various types of occupied habitat, and balance short-term risks with long term tradeoffs (USDI Fish and Wildlife Service 1997, page 139).

To date the FWS believes it has successfully applied this recommendation. Within this context it should be recognized that incidental take of murrelets associated with known or likely occupied habitat on non-Federal lands has been authorized through the section 7 and section 10 processes. For example, section 7 consultation has permitted incidental take of murrelets in several recent HCPs (Table 14); each of these approved actions retained the highest quality habitat as part of a management strategy that was consistent with the Recovery Plan.

Table 14. Summary of habitat acres addressed in various section 7 consultations involving marbled murrelets on non-Federal lands.

Action	Date	Total Plan Area	Total Suitable Acres	Suitable Acres Harvested	Estimated Occupied Acres Potentially Taken	Relative Habitat Quality	Permit Length
Elliott HCP[1]	10/96	93,000	13,000	3,138	785	L	6 years
WA DNR HCP[2]	1/97	1,600,000	149,000	up to 33,000-126,000, but less expected	up to 18,000-74,000, but less expected	L	70 years
Quinalt BO RPA[3]	1/98	4,885	4,885	1,600	1,125	L/M	NA

[1] Biological Opinion on the Proposed Issuance of an Incidental Take Permit (PRT-803344) for Northern Spotted Owls and Marbled Murrelets to the Oregon Department of Forestry on the Elliott State Forest, Coos and Douglas Counties, Oregon

[2] Intra-FWS Concurrence Memorandum and Biological Opinion on the Proposed Issuance of an Incidental Take Permit (PRT-812521) for Northern Spotted Owls, Marbled Murrelets, et al. and the Approval of the Implementation Agreement for the Washington State Department of Natural Resources Habitat Conservation Plan

[3] Biological Opinion on the Quinalt North Boundary Area Unit Management Plan, Quinalt Indian Nation, January 28, 1998 (USDI Fish and Wildlife Service 1998).

Marbled murrelet critical habitat

Current legal status

Designation history

Critical habitat was initially proposed on January 27, 1994 (USDI Fish and Wildlife Service 1994a). A revised critical habitat proposal was published August 10, 1995 (USDI Fish and Wildlife Service 1995). A final critical habitat rule was published May 24, 1996 (USDI Fish and Wildlife Service 1996a).

Primary constituent elements

Description

The following five paragraphs quote directly from the final rule designating critical habitat for the marbled murrelet (USDI Fish and Wildlife Service 1996a).

The FWS has determined that the physical and biological habitat features (referred to as the primary constituent elements) associated with the terrestrial environment that support nesting roosting and other normal behaviors are essential to the conservation of the marbled murrelet and require special management considerations

Within areas essential for successful marbled murrelet nesting, the FWS has focused on the following primary constituent elements: (1) individual trees with potential nesting platforms; and (2) forested areas within 0.5 miles of individual trees with potential nesting platforms, and with a canopy height of at least one-half the site potential tree height. This includes all such forest, regardless of contiguity. These primary constituent elements are essential to provide and support suitable nesting habitat for successful reproduction of the marbled murrelet.

Individual nest trees include large trees, generally more than 32 inches dbh with the presence of potential nest platforms or deformities such as large or forked limbs, broken tops, dwarf mistletoe infections, witches brooms, or other formations providing platforms of sufficient size to support adult murrelets. Because marbled murrelets do not build nests, moss or detritus may be important to cushion or hold the egg. Platforms should have overhead cover for protection from predators and weather, which may be provided by overhanging branches, limbs above the nest area, or branches from neighboring trees. Based on current information from Washington, Oregon, and California, nests have been found in Douglas-fir, coastal redwood, western hemlock, western red cedar, or Sitka spruce (Hamer and Nelson 1995).

On a landscape basis, forests with a canopy height of at least one-half the site potential tree height in proximity to potential nest trees are likely to contribute to the conservation of the marbled murrelet. These forests may reduce the differences in microclimates associated with forested and unforested areas (Chen et al. 1992, Chen et al. 1993), reduce potential for windthrow during storms (Chen et al. 1992), and provide a landscape that has a higher probability of occupancy by marbled murrelets (Raphael et al. 1995). The site-potential tree is the average maximum height for trees given the local growing conditions, and is based on species-specific site index tables. Nest trees may be scattered or clumped throughout the area.. Potential nesting areas may contain fewer than one suitable nesting tree per acre.

Within the boundaries of designated critical habitat, only those areas that contain one or more primary constituent element are, by definition, critical habitat. Areas without any primary constituent elements are excluded by definition.

<u>Threats</u>

Activities that disturb or remove primary constituent elements may adversely affect marbled murrelet critical habitat. Examples of these activities include, but are not limited to, (1) forest management activities which greatly reduce stand canopy closure, appreciably alter the stand structure, or reduce the availability of nesting sites; (2) land disturbance activities and road building, and (3) harvest of certain types of commercial forest products (USDI Fish and Wildlife Service 1996a).

Status and distribution

In the following discussion, to the extent possible, the estimated amount of habitat that contains the primary constituent elements and that therefore is actually designated as critical habitat will be distinguished from the total area encompassed within the critical habitat units (CHUs). As a result of natural factors and past timber harvest, marbled murrelet habitat often occurs in a patchy distribution. This habitat was encompassed in CHUs designated by legal descriptions. Therefore, many CHUs contain areas that do not include primary constituent elements, and thus, the actual acreage of designated critical habitat is often substantially less than the total acreage encompassed within the boundaries of the units.

Designated critical habitat within Washington, Oregon, and California includes 32 CHUs encompassing about 3,887,000 acres. Twenty-two of these units include non-Federal lands; non-Federal lands comprise about 22 percent of the total acreage. In most cases the exact amount of habitat that contains the primary constituent elements within these units is unknown. Critical habitat is primarily based on the LSRs identified in the Northwest Forest Plan (approximately 3 million of the 3.9 million acres, or 78 percent). The Federal LSRs reserves were designed to respond to the problems of fragmentation of suitable murrelet habitat, potential increases in predation due to fragmentation, and reduced reproductive success of murrelets in fragmented habitat. The LSR system identifies large, contiguous blocks of forest that are to be managed for the conservation and development of these older forest features required by the murrelet, and as such, serve as an ideal basis for murrelet critical habitat. Where the LSRs were not sufficient to provide habitat considered critical for the survival and recovery of the murrelet, other lands were identified, including state (21 percent), private lands (1.2 percent), county (0.2 percent), and city (0.003 percent)(USDI Fish and Wildlife Service 1996a).

The Marbled Murrelet Recovery Team identified six Conservation Zones in the 3-state range of the species (USDI Fish and Wildlife Service 1997). Conservation Zone 4, which includes the project area, extends from North Bend, Oregon, to the southern end of Humboldt County, California, and includes portions of CHUs OR-04, OR-06, OR-07, CA-01, CA-02, CA-03, CA-04, and CA-11. This zone has large blocks of suitable habitat critical to the three-state murrelet population recovery over the next 100 years. Most of these large blocks are located in Redwood National Park and state parks. State parks in the park complex were designated as critical habitat, but because national parks are generally managed by statutory requirements to protect natural ecosystems for the benefit of wildlife, they may not require special management consideration or protection, which was one of the criteria for designation of critical habitat. Redwood National Park was considered for designation, but the park's statutory authority and general management goals were considered adequate to conserve the species without the additional designation of critical habitat. In effect, the park thus functions as de facto critical habitat in Conservation Zone 4 because of those statutory protections (USDI Fish and Wildlife Service 1996a). The acreage within the Conservation Zone 4 CHU units is 900,389, with another 75,451 acres located in Redwood National Park for a total of 975,840 acres. Approximately 552,751 of these acres, including the Redwood National Park acreage, are in California.

The amount of acreage within the CHUs that actually contains the primary constituent elements and therefore constitutes critical habitat is uncertain. Because most Northwest Forest Plan LSRs within the range of the murrelet were designated as critical habitat, and the LSRs are believed to contain about 1,295,000 acres of marbled murrelet nesting habitat (USDA Forest Service and

USDI Bureau of Land Management 1994), that figure is regarded as a minimum amount of actual critical habitat within the 3-state range. A somewhat more precise estimate can be derived for Conservation Zone 4. In CHUs within the Oregon portion of Conservation Zone 4, there are approximately 116,500 acres that appear to be suitable for marbled murrelets (FWS GIS data). On the Six Rivers National Forest in northwestern California, there are an estimated 106,984 acres of apparently suitable habitat within critical habitat (K. Schmidt, pers. comm., January 20, 1999). About 19,640 acres within Redwood National Park consists of old-growth redwood, and another 19,342 acres of old-growth are found on the associated state parks in northern Humboldt and Del Norte Counties (USDI National Park Service 1998). All of these acres are believed to contain the primary constituent elements and thus constitute either de facto or designated critical habitat. Including the habitat listed in Table 15 below, the total amount of habitat containing primary constituent elements within CHUs in Conservation Zone 4, including Redwood National Park, is estimated at approximately 308,294 acres.

The amount of habitat within critical habitat units in the southern portion of Conservation Zone 4, in proximity to the action area, is summarized in table 15.

Table 15. Marbled murrelet critical habitat in proximity to action area.

Unit	Total acres	Est. acres suitable Or with PCE	Ownership
CA-03-a	40,417	12,306	PALCO & other private
CA-04-a	54,081	23,663	State Parks (HRSP & GCSP)[1]
CA-04-b	574	574	State Parks (HRSP)
CA-05-a	38,698	7,956	BLM (King Range)[2]
CA-11-b	1,111	179	BLM (Iaqua portion of larger unit)
CA-11-c	2,731	1,150	BLM (Larabee)
TOTAL	**137,612**	**45,828**	

[1] Based on FWS GIS and Final EIR Table N2-3B

[2] Based on FWS GIS and Hawks, S. Personal Communication, USDI, Bureau of Reclamation. February 3, 1999.

It should be remembered that large portions of designated critical habitat are apparently not currently occupied by the species, even where habitat appears suitable or contains primary constituent elements. For instance, in CHU-CA-04-a, on Humboldt Redwoods State Park, over 23,000 acres appear to be suitable, but less than 8,000 acres are currently believed to be occupied. Although the CHUs near the project area (listed in Table 15 above) all contain the primary constituent elements in the form of large trees with apparent nesting platforms, and appear otherwise suitable for use by murrelets, surveys have determined that only CHUs CA-03-a and CA-04-a are occupied by murrelets at this time. Reasons for this are unknown. The most obvious factor is that the two areas occupied by murrelets are dominated by coastal redwood forest, while the others are dominated by Douglas-fir forest.

Another difficulty in assessing the amount of existing critical habitat for the marbled murrelet derives from the inclusion in designated critical habitat of any tree within CHUs that contains a suitable nest platform. Large-scale assessments based on remote sensing cannot identify scattered individual trees with these characteristics that are not within identifiable timber stands. Therefore, for the purposes of this evaluation, it is assumed that an unquantifiable amount of critical habitat exists within all CHUs in excess of the acreage reported above, that this factor applies proportionally at all scales of analysis, and that such habitat is if relatively low value because of the low amount of nesting substrate.

<u>Western snowy plover</u>

Species description

The snowy plover is a small, pale, migratory shorebird of the family Charadriidae that occurs over much of the North American coast and at some inland sites in the United States and Mexico. Two subspecies of snowy plover occur in North America. The Pacific coast population belongs entirely to the subspecies *C. a. nivosus.* This subspecies breeds along the Pacific coast from southwestern Washington to mainland Mexico and Baja California and at some interior sites of California, Oregon, and other western states. On the Pacific coast, larger concentrations of breeding birds occur in the south than in the north, suggesting that the center of the plover's coastal distribution lies closer to the southern boundary of California. For a complete life history and taxonomic description of this species, refer to Page et al. (1995).

The Pacific coast population is genetically isolated from western snowy plovers breeding in the interior. Intensive banding and monitoring studies have documented only two isolated instances of intermixing between coastal and interior populations of nesting birds. Snowy plovers tend to be site faithful, with the majority of birds returning to the same nesting location in subsequent years.

Life history

<u>Definition of suitable habitat</u>

This subspecies nests on barren to sparsely vegetated sand beaches, dry salt flats in lagoons, dredge spoils deposited on beach or dune habitat levees and flats at salt-evaporation ponds, and, in at least one area, river gravel bars (Tuttle et al. 1997). Suitable habitat is characterized by a nearly complete absence of vegetation and other structure.

<u>Distribution</u>

The subspecies' Pacific population occurs from southwest Washington into Baja Mexico. The species is most numerous in southern portions of its range (southern California).

Reproduction

Snowy plovers may make up to three nesting attempts per year, depending on local conditions and the success of previous attempts. Nesting occurs in loose colonies from March or April through August or September, which coincides with the season of greatest human use in their habitats. Adult birds tend to remain close to the nest (Page et al. 1977) and are known for their fidelity to specific nesting areas from year to year (Warriner et al. 1986). Plover chicks are precocial, leaving the nest to search for food within hours of hatching, and rarely remain in the immediate nest vicinity until fledging.

Nest success ranges from 0 to 80 percent for coastal snowy plovers. Instances of low nest success have been attributed to a variety of factors, including predation, human disturbance, and inclement weather conditions. Reproductive rate ranges from 0.05 to 2.40 young fledged per female, pair, or nest. Page et al. (1977) estimated that snowy plovers must fledge 0.8 young per female per year to maintain a stable population. Although recovery attempts have been successful in some areas of this species range, many birds continue to be subjected to disturbance during nesting season.

Diet

Snowy plovers forage on invertebrates.

Cover requirements

Cover requirements seem limited to small debris (e.g., shells, aquatic wrack, small driftwood) that accumulates near tidal lines on beaches.

Dispersal

Birds nesting inland normally migrate to coastal sites, and coastal nesting birds may move northward or southward along the coast from breeding sites to winter sites. Along the Eel River, near the action area, plovers may form loose groups on gravel bars during late summer. Little is known of the species' use of these gravel bars during winter months.

Special habitat needs

The primary habitat need of the snowy plover is open beaches or beach-like habitats that provide a broad view of surrounding areas, so that predators can be detected. In addition, sparse wrack from kelp, seaweed, small driftwood, or other organic debris contributes to local roost and feeding sites. Freedom from human disturbance at these sites, including indirect adverse effects from increased predator numbers, would probably substantially improve reproductive success. Abundant food sources (e.g., invertebrates) are likely needed for successful nesting and brood rearing.

Current legal status

Listing history

The western snowy plover was listed on March 5, 1993 as a Federally threatened species (USDI Fish and Wildlife Service 1993), and is also a California species of special concern (CDFG

1998a). Critical habitat was proposed on March 2, 1995 (USDI Fish and Wildlife Service 1995c); no final rule was published due to a moratorium on listing actions. Currently, the FWS is under court order to publish a final rule for critical habitat for the species before December 1, 1999.

<u>Reasons for listing</u>

The western snowy plover was listed under the Act due to declining population levels caused by habitat loss from urban development and the invasion of European beachgrass (*Ammophila arenaria*), as well as disturbance and direct mortality from a variety of factors, including off-highway vehicles, humans, and their pets.

<u>Threats</u>

The most important form of habitat loss to coastal breeding plovers has been the encroachment of European beach grass and other introduced plant species, resulting in stabilized, heavily vegetated dunes. This stabilization eliminates sparsely vegetated beach above the tideline, decreases the width of the beach, and increases the slope. These changes reduce the amount of potential snowy plover nesting habitat on many beaches and may hamper brood movements. The beachgrass community also provides habitat for snowy plover predators, resulting in predation that historically would have been minimized by the lack of cover in the open beach habitat.

In the habitat remaining for snowy plover nesting, human activities are a key factor in the ongoing decline in snowy plover coastal breeding sites and breeding populations in California, Oregon, and Washington. The nesting season of the western snowy plover coincides with the season of greatest human use on beaches of the west coast. Snowy plovers are highly susceptible to disturbances caused by the human use of their breeding sites. The current level of human encroachment upon remaining nest sites results in a disruption of nesting activities that far exceeds what plovers experienced historically; this likely results in lost nests, eggs, and chicks due to direct harm and failure to adequately incubate eggs and brood young. Human activities detrimental to nesting snowy plovers include unintentional disturbance (e.g., walking, jogging, horseback riding, pets, off-road vehicles, and beach raking) and direct mortality (e.g., unintentional trampling of eggs and chicks by people, unleashed pets, and off-road vehicles). Gravel mining in particular has been noted as a concern for birds that may be nesting in the vicinity of the action area.

An additional factor affecting net productivity of plovers, indirectly, is the increased predation on nests associated with increased populations of crows (*Corvus brachyrhynchos*), ravens (*Corvus corax*) and other predators. Populations of these predatory species, known to prey on plover eggs and chicks, are likely greater due to the availability of supplemental food sources from human trash.

The subspecies may be susceptible to contaminants in its habitat (e.g., offshore oil spills), but the magnitude of that threat has not been well documented. During 1997 and 1998, three oil spills occurred in showy plover habitat along the California coast, resulting in oiled plovers.

Conservation needs

The primary habitat need of the snowy plover is open beaches or beach-like habitats free from human disturbance. Adequate food sources (e.g., invertebrates) are needed for successful nesting and brood rearing. Human activities are a key factor in the ongoing decline in snowy plover coastal breeding sites and breeding populations. Human activities detrimental to nesting snowy plovers include unintentional disturbance (e.g., walking, jogging, running pets, horseback riding, off-road vehicles, and beach raking) and direct mortality (e.g., unintentional trampling of eggs and chicks, by people and their unleashed pets and by off-road vehicles). Therefore, the primary conservation needs of the western snowy plover are habitat restoration through the removal of invasive exotic plant species (primarily European beach grass) that cause the loss of open beach habitats, protection of nesting and brood-rearing sites from human disturbance, and protection from elevated levels of predation. Currently, no plovers have been detected on any PALCO ownership in the action area, and no plovers have been detected on any PALCO "vested interests" lands within the action area. Therefore, current PALCO lands do not play a role in the recovery of the western snowy plover. However, should the species expand its range to include lands under PALCO control, or should PALCO acquire lands or vested rights that includes habitat for plovers, PALCO lands may be important for future recovery of the species.

Status and distribution

Species

Numbers and distribution

Historic records indicate that nesting western snowy plovers were once more widely distributed on the Pacific coast than they currently are. In coastal California, snowy plovers bred at 53 locations prior to 1970; since that time, no evidence of breeding birds has been found at 33 of those 53 sites, a 62 percent decline in breeding sites (Page and Stenzel 1981).

The plover breeding population in California, Oregon, and Washington declined 17 percent between 1977 and 1989 (Page et al. 1991). In 1981, the coastal California breeding population of snowy plovers was estimated to be 1,565 adults (Page and Stenzel 1981). In 1989, surveys revealed 1,386 plovers (Page et al. 1991), an 11 percent decline in the breeding population.

Suitable habitat

Acreage and distribution

The most recent quantification of potential breeding habitat for the western snowy plover indicates that upwards of 145 potential breeding and/or wintering sites may be available to the plover within its historic range along the Pacific coast in California, Oregon and Washington. These sites include approximately 43,464 acres of potential habitat along 453.4 miles of coastline. In addition to this beach habitat, an additional 21 sites in California (including salt ponds, river levees, airports, and coastal marshes) with an undisclosed number of acres are potentially suited to plover breeding and/or wintering.

Quality

Virtually all snowy plover nesting habitat has been affected by invasive exotic plant species, resulting in more densely vegetated beach habitats for nesting. Plovers tend to avoid habitats with more than just sparse vegetation. Nearly all nesting habitats have been affected by human disturbance, including actual human presence, their vehicles and equipment, and human-associated pets, especially dogs. Some nesting habitats may be of lower quality due to the presence of elevated levels of predators, including Common Raven, American Crows, and mammalian predators.

Southern Oregon/Northern California Coast ESU coho salmon

Species description

The coho salmon is an anadromous salmonid species that was historically widely distributed throughout the North Pacific Ocean from Central California to Point Hope, Alaska; through the Aleutian Islands, and from the Anadyr River, Russia, south to Hokkaido, Japan. Coho are very similar in appearance to chinook salmon (*O. tshawytscha*) while at sea (blue-green back with silver flanks), but they are smaller than chinook salmon. Coho salmon adults can be distinguished from small chinook salmon by the lack of spots on the lower portion of the tail. During this century, naturally-producing populations of coho salmon have declined or have been extirpated in California, Oregon, and Washington. The coho salmon status review (Weitkamp et al. 1995) identified six distinct population segments (Evolutionarily Significant Units - ESUs) in these three states and noted that natural runs in all ESUs are substantially below historical levels (Weitkamp et al. 1995). The action area is within the Southern Oregon/Northern California Coast (SONCC) ESU.

Life History

General life history information for coho salmon is summarized below. Further information is available in the status review (Weitkamp et al. 1995), the proposed rule for listing coho salmon (50 FR 38011), and the final rule listing the SONCC coho salmon ESU (62 FR 24588).

Most coho salmon exhibit a three-year life cycle. They spend approximately 18 months in fresh water and 18 months in salt water (Gilbert 1912, Pritchard 1940, Briggs 1953, Shapovalov and Taft 1954, Loeffel and Wendler 1968). The primary exception to this pattern is 'jacks', which are sexually mature males that return to freshwater to spawn after only 5 to 7 months in the ocean. Most coho salmon enter rivers between September and February and spawn from November to January. Coho salmon river entry timing is influenced by many factors, one of which appears to be river flow. In addition, many small California systems have sandbars which block their mouths for most of the year except during the winter. In these systems, coho salmon and other salmon species are unable to enter the rivers until sufficiently strong freshets break the sandbars (Sandercock 1991). Migration normally occurs when water temperatures are between 44.6° and 60.1°F, minimum water depth is seven inches and streamflow velocity does not exceed 8.0 feet per second (Reiser and Bjornn 1979). Once coho salmon have entered the river, they must navigate past waterfalls, debris jams, culverts, high water velocities, and other barriers in order to access spawning areas upstream.

Coho salmon spawn between November and January (Hassler 1987) and occasionally into February and March (Weitkamp et al. 1995). Coho salmon populations in northern California may spend 1 or 2 months in fresh water before spawning (Flint and Zillges 1980; Fraser et al. 1983). In larger river systems, coho salmon have a broad period of fresh water entry spanning from August until December (Leidy and Leidy 1984). In general, earlier migrating fish spawn farther upstream within a basin than later migrating fish, which enter rivers in a more advanced state of sexual maturity (Sandercock 1991).

Coho salmon generally build their redds at the head of riffles where there is good intra-gravel flow and oxygenation. Coho salmon appear to favor areas where the stream velocity is 1.0 to 1.8 ft/s (Gribanov 1948) and stream depth is greater than 7.1 inches (Thompson 1972, cited in Bjornn & Reiser 1991). Water quality can be clear or heavily silted with varying substrate of fine gravel to coarse rubble. Bell (1986) indicated that substrate for anadromous salmonids should range from 0.5 to 4.0 inches in diameter. In California, coho salmon spawn in water temperatures of 42.08° to 55.94°F (Briggs 1953). Coho salmon build redds averaging about 30 ft^2, but the spatial area required per spawning pair is much larger, about 126 square feet (Burner 1951; cited in Bjornn and Reiser 1991).

Coho salmon eggs incubate for approximately 35 to 50 days between November and March. The duration of incubation may change depending on ambient water temperatures (Shapovalov and Taft 1954). Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity. Fry start emerging from the gravel two to three weeks after hatching (Hassler 1987). Young fry hide in gravel and under large rocks during daylight hours. After several days growth, fry move into shallow areas near the stream banks, seeking out quiet backwaters, undercut banks, side channels, and small creeks, especially those with overhanging riparian vegetation (Gribanov 1948). Citing several studies, Bjornn and Reiser (1991) concluded that newly emerged fry require velocities of less than 0.33 feet per second. As coho salmon fry grow larger, they disperse upstream and downstream, moving into areas with less cover and higher velocity flows (Lester and Genoe 1970), where they establish and defend territories (Hassler 1987). Fry feed mainly on aquatic and terrestrial insects (Mundie 1969; cited in Meehan and Bjornn 1991).

In California, fry move into deep pools in July and August, where feeding is reduced and growth rate decreased (Shapovalov and Taft 1954). During the summer, coho salmon fry prefer pools and riffles featuring adequate cover such as large woody debris, undercut banks, and overhanging vegetation. High summer water temperatures can affect juveniles. Brett (1952) found that juvenile coho salmon had an upper lethal temperature of 77°F but that optimal temperatures appeared to be between 54 and 57°F. In smaller California streams, water levels may drop so low during the summer that the pools are the only viable rearing habitat. No passage between pools can occur until river levels rise with the onset of the rainy season. Therefore, juvenile salmonids rearing in isolated summer pools are extremely vulnerable to disturbance or water quality impacts. Daytime temperatures in summer rearing pools may be near lethal levels; riparian shading and the presence of sub-surface cold water seeps are often essential to maintain pool temperatures at tolerable levels.

Between December and February, winter rains result in increased stream flows. Juvenile coho salmon prefer to over-winter in large mainstem pools, backwater areas, and secondary pools with large woody debris and undercut bank areas (Heifetz et al. 1986; Hassler 1987). These protected areas serve as velocity refugia from high winter flows. As they grow larger, juveniles tend to move away from shore into mid-stream and higher velocity areas. Coho salmon rear in fresh water for up to 15 months, then migrate to the sea as smolts between March and June (Weitkamp et al. 1995). Peak outmigration generally occurs in May, about a year after fry emerge from the gravel. Most smolts measure 3.5 to 4.5 inches, although Klamath River Basin smolts tend to be larger; this is possibly due to influences of off-station hatchery plants.

After entering the ocean, immature coho salmon initially remain in near-shore waters close to the parent stream. In general, coho salmon remain closer to their river of origin than do chinook salmon (Weitkamp et al 1995). Nevertheless, coho salmon have been captured several hundred to several thousand kilometers away from their natal stream (Hassler 1987). Coho salmon typically spend two growing seasons in the ocean before returning to their natal streams to spawn as three-year-olds.

Current Legal Status

<u>Listing history</u>

The SONCC coho salmon ESU was listed as threatened under the Act on May 6, 1997 (62 FR 24588). This ESU includes populations of coho salmon between Cape Blanco, Oregon, and Punta Gorda, California. An interim rule under section 4(d) of the Act was published on July 18, 1997 (62 FR 3847) applying the prohibitions contained in section 9(a) of the Act to the California portion of the ESU. Critical habitat was proposed for the SONCC ESU and the Central California Coast ESU on November 25, 1997 (62 FR 62741).

<u>Threats</u>

The SONCC ESU of coho salmon was listed as threatened due to numerous factors including several long-standing, human-induced factors (e.g., habitat degradation, harvest, water diversions, and artificial propagation) that serve to exacerbate the adverse effects of natural environmental variability (e.g., floods, drought, poor ocean conditions). Habitat factors that may contribute to the decline of coho salmon in the SONCC ESU include changes in channel morphology, substrate changes, loss of instream roughness and complexity, loss of estuarine habitat, loss of wetlands, loss and/or degradation of riparian areas, declines in water quality, altered streamflows, impediments to fish passage, and elimination of habitat. The major activities identified as responsible for the decline of coho salmon in Oregon and California include logging, road building, grazing, mining, urbanization, stream channelization, dams, wetland loss, beaver trapping, water withdrawals, and unscreened diversions for irrigation.

Tribal harvest is not considered a major factor in the decline of coho salmon in the SONCC ESU. In contrast, overfishing in non-tribal fisheries is believed to have been a significant factor. Disease and predation are not believed to be major causes in the species decline, however, they may have substantial impacts in local areas. For example, Higgins et al. (1992) and CDFG (1994) reported that Sacramento River squawfish have been found in the Eel River basin and are considered to be a major threat to native coho salmon. Furthermore, California sea lions and Pacific harbor seals, which occur in most estuaries and rivers where salmonid runs occur on the west coast, are known predators of salmonids. Harbor seals are present year-round near Cape Mendocino. California sea lions are present in the near Cape Mendocino in the fall and spring. At the mouth of the Eel River, harbor seals haul-out in large numbers (600-1050 seals). More than 1,200 harbor seals have been counted in the vicinity of Trinidad Head. Coho may be vulnerable to impacts from pinniped predation. In the final rule listing the SONCC ESU, NMFS indicated that it was unlikely that pinniped predation was a significant factor in the decline of coho salmon on the west coast, although they may be a threat to existing depressed local populations. The NMFS (1997)has recently determined that although pinniped predation did not cause the decline of salmonid populations, in localized areas where they co-occur with salmonids (especially where salmonids concentrate or passage may be constricted), predation may preclude recovery. Specific areas where predation is/may preclude recovery cannot be determined without extensive studies.

Existing regulatory mechanisms, including land management plans (e.g., National Forest Land Management Plans, State Forest Practice Rules), Clean Water Act section 404 activities, urban growth management, and harvest and hatchery management all contributed to varying degrees to the decline of coho salmon due to the lack of protective measures, the inadequacy of existing measures to protect coho salmon and/or its habitat, or the failure to carry out established protective measures. Finally, artificial propagation is a factor in the decline of coho salmon due to the genetic impacts on indigenous, naturally-reproducing populations, disease transmission, predation of wild fish, depletion of wild stock to enhance brood stock, and replacement rather than supplementation of wild stocks through competition and the continued annual introduction of hatchery fish. Since the listing of the SONCC ESU, these threats have remained constant and no new threats have been identified.

Conservation needs

A recovery plan has not yet been developed for listed coho salmon ESUs. Therefore the conservation needs for coho salmon discussed here are derived from the final rule listing the SONCC ESU, the proposed designation of critical habitat for the Central California Coast ESU and the SONCC ESU, and Spence et al. (1996).

Conservation needs for coho salmon include habitat conditions that contribute to meet the spawning, rearing, migrating, feeding, and sheltering needs of the species. Parameters that affect the ability of the habitat to provide for these conservation needs include water quality and quantity, habitat access, physical habitat elements, channel condition, hydrology, and upslope conditions. These essential habitat features must be healthy, or in properly functioning condition (PFC), in order for the conservation needs of coho salmon to be met.

Water quality factors essential to coho salmon include cool temperatures, low turbidity, and pollutant-free water. The ability of coho salmon to access various habitats during different life stages is also essential. Physical structural elements such as the presence of LWD, clean, properly sized substrate, large, deep pools, and the presence of side channels and off-channel habitats are also essential for coho salmon. Many of the physical and water quality elements vital to coho salmon are provided by the riparian vegetation adjacent to streams. Riparian buffer integrity is therefore also an essential habitat feature. This element includes a mature, well stocked riparian forest to provide large trees for recruitment into the stream, overstory canopy to provide shade, downed wood and an undisturbed humic layer to filter overland sediment flow, snags, and stable banks. Details of how these essential habitat elements provide for the conservation needs of coho salmon and the other Pacific salmonids are discussed in the analysis of suitable habitat.

In order to conserve coho salmon, an adequate number of healthy wild populations must be maintained. Therefore, the proper management of hatchery operations and ocean harvesting is necessary such that they will not negatively impact the species, affecting the continued survival and recovery of coho salmon.

Status and Distribution

Available historical and recent coho salmon abundance information is summarized in the status review (Weitkamp et al. 1995). In the recent past, the majority of the SONCC ESU coho salmon production has been from the Oregon portion, in the Rogue River. Recent run-size estimates (1979-1986) have ranged from 800 to 19,800 naturally-produced adults, and from 500 to 8,300 hatchery-produced adults (Cramer 1994). Adult passage counts at Gold Ray dam provide a long-term view of coho salmon abundance on the upper Rogue River. During the 1940s, counts averaged about 2,000 adult coho salmon per year. Between the late1960s and early 1970s, adult counts averaged fewer than 200. During the late 1970s, dam counts increased, corresponding with returning coho salmon produced at the Cole River Hatchery. Coho salmon run size estimates derived from seine surveys at Huntley Park near the mouth of the Rogue River have ranged from approximately 450 to 19,200 naturally-produced adults between 1979 and 1991. In Oregon, south of Cape Blanco, the American Fisheries Society (AFS) Endangered Species Committee (Nehlsen et al. 1991) considered all but one coho salmon population to be at "high risk of extinction", while Nickelson et al. (1992) rated these coho salmon populations as "depressed."

In the northern California region of this ESU, CDFG (1994) reported that coho salmon stocks, including hatchery stocks, could be less than six percent of their abundance during the 1940s and have experienced at least a 70 percent decline in numbers since the 1960s. The Klamath River Basin (including the Trinity River) historically supported abundant coho salmon runs. In both systems, runs have greatly diminished and are now composed largely of hatchery fish, although small wild runs may remain in some tributaries (CDFG 1994). CDFG (1994) further reported that coho salmon populations have been virtually eliminated in many streams, and that adults are observed only every third year in some streams, suggesting that two of three brood cycles may already have been eliminated. Brown and Moyle (1991) estimated that naturally-spawned adult coho salmon returning to California streams were less than one percent of their abundance at mid-century, and indigenous, wild coho salmon populations in California did not exceed 100 to 1,300 individuals. Further, they stated that 46 percent of California streams which historically supported coho salmon populations, and for which recent data were available, no longer supported runs.

Of the 396 streams within the SONCC ESU identified as once having coho salmon runs, recent survey information is available for 117 streams (30 percent) (Brown et al. 1994). Of these streams, 73 (64 percent) still support coho salmon runs while 42 (36 percent) have lost their coho salmon runs (Weitkamp et al. 1995).

The rivers and tributaries in the California portion of this ESU were estimated to have average recent runs of 7,080 natural spawners and 17,156 hatchery returns, with 4,480 identified as native fish occurring in tributaries having little history of supplementation with non-native fish. Combining recent run-size estimates for the California portion of this ESU with the Rogue River estimates provides a run-size estimate for the entire ESU of about 12,000 natural coho salmon and 21,000 hatchery-produced coho salmon.

Coho salmon from this ESU are captured primarily in ocean fisheries off California. Coded-wire tagged (CWT) coho released from hatcheries south of Cape Blanco have a southerly recovery pattern: primarily in California (65-92 percent), with some recoveries in Oregon (7 to 34 percent) and almost none (less than 1 percent) in Washington or British Columbia (percent data represent range of recoveries for five hatcheries by state or province) (Wietkamp et al., 1995). Ocean exploitation rates for SONCC coho are based on the exploitation rate on Rogue/Klamath hatchery stocks and have only recently become available. For both 1996 and 1997, the estimated ocean exploitation rates were 5 percent. The estimated rate for 1998 was 12 percent.

According to the status review (Weitkamp et al. 1995), significant blockages of freshwater habitat were identified in every ESU and freshwater and estuarine habitats were degraded throughout the species' range. Data are limited for the SONCC ESU. Currently, many river systems are no longer suitable for coho salmon or support only depressed populations due to degraded habitat, including high, sometimes lethal, water temperatures, blockages preventing access to spawning and juvenile rearing areas, increased levels of fine sediment smothering eggs and hindering emergence of fry from gravels, loss of instream complexity and roughness, dewatering of stream reaches, changes in the flow regime, and loss of riparian vegetation that provided shade, cover, bank stability, and nutrients.

Information on salmonid presence within the action area has been gathered using various protocols and with variable effort. Most studies provide only information on species presence, and cannot be used to establish population trends. Furthermore, many of the studies are several years old, so their information may no longer be accurate. Nevertheless, the studies do provide some indication of the presence and distribution of salmonids within the action area, if not accurate population and trend data. Information for this discussion was taken from the July 1998

Draft SYP/HCP(PALCO 1998) and the KRIS Coho CD-ROM, a computer database developed by the Institute for Fisheries Resources (IFR) based on the Klamath Resource Information System computer program (Derksen 1997). KRIS Coho (IFR 1998) contains data tables, charts, photographs, maps, and bibliographic material from the public domain related to watersheds within the Plan area. The information from the Draft SYP/HCP and IFR (1998) focuses on watersheds within the Plan area, rather than the larger action area. Several assumptions have been made. For example, chinook salmon, coho salmon, and steelhead are known to occur in the Mattole River basin, but have not been documented on PALCO lands. It is important to note, however, that many areas (e.g., North Fork Mattole, portions of which are on PALCO lands) have not been surveyed for these species. In those unsurveyed areas, we have presumed the presence of salmonids if habitat for them exists (see table 3.8.5 of the Final EIS/EIR).

PROPOSED SPECIES/CRITICAL HABITAT:

Southern Oregon and California Coastal ESU chinook salmon

Species description

The chinook salmon is an anadromous salmonid easily distinguished from other *Oncorhynchus* species by its large size. Adults weighing over 120 pounds have been caught in North American waters. Historically, chinook salmon ranged as far south as the Ventura River, California, and as far north as the Russian Far East. Destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors have been identified as causing the significant decline of chinook salmon populations throughout its range. The chinook salmon status review (Myers et al. 1998) identified 15 chinook salmon ESUs throughout Washington, Oregon, Idaho, and California. The action area is within the Southern Oregon and California Coastal (SOCC) ESU.

Life history

General life history information for chinook salmon is summarized below. Further detailed information on chinook salmon ESUs are available in the NMFS listing of winter-run chinook as threatened under emergency provisions of the Act (54 FR 32085), the NMFS formal listing of the winter-run chinook salmon (55 FR 46515), the NMFS reclassification of the winter-run chinook salmon as an endangered species (59 FR 440), the NMFS status review of chinook salmon from Washington, Oregon, Idaho, and California (Myers et al. 1998), and the NMFS proposed rule for listing several ESUs of chinook salmon (63 FR 11482).

Chinook salmon exhibit diverse and complex life history strategies. Healey (1986) described 16 age categories for chinook salmon and seven total ages with three possible freshwater ages. Two generalized freshwater life-history types were described by Healey (1991): "stream-type" chinook salmon reside in freshwater for a year or more following emergence, whereas "ocean-type" chinook salmon migrate to the ocean within their first year. For the most part, chinook salmon in the SOCC ESU exhibit an "ocean-type life history."

Chinook salmon mature between 2 and 6+ years of age (Myers et al. 1998). Freshwater entry and spawning timing of chinook salmon are generally thought to be related to local temperature and water flow regimes. For fall run chinook salmon, migration begins when stream temperatures range between 51 and 67°F. For spring run chinook salmon, temperatures between 38 and 56°F trigger freshwater entry (Bell 1986, cited in Bjornn and Reiser 1991). For both runs, chinook salmon require a minimum of 0.79 feet of water for upstream migration and a maximum velocity of 8 feet per second (Thompson 1972, cited in Bjornn and Reiser 1991).

Chinook salmon runs are designated on the basis of adult migration timing, however, distinct runs also differ in the degree of maturation at the time of river entry, the thermal regime and flow characteristics of their spawning site, and the actual time of spawning (Myers et al. 1998). Spring-run chinook salmon typically enter freshwater as immature fish, migrate upriver between March and July, and finally spawn in the late summer and early autumn with a peak in September. This run timing appears adapted to gaining access to the upper reaches of river systems, 1,500 to 5,200 feet in elevation, prior to the onset of high water temperatures and low flow that would inhibit access to these areas during the fall. In contrast, fall-run chinook salmon enter freshwater at an advanced stage of maturity between June and December, with a peak in September and October. They move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Chinook salmon in the Eel, Rogue, and Upper Klamath Rivers return to freshwater in August and September and spawn in late October and early November (Stone 1897, Snyder 1931; Nicholas and Hankin 1988, Barnhart 1995, cited in Myers et al. 1998).

Once adult chinook salmon reach spawning areas, they need cold pools to stage in prior to spawning to conserve energy and maintain egg viability as they mature for spawning (Berman and Quinn 1991). Maximum temperatures for holding adults are 59.0 to 60.0°F, but better egg viability is achieved at 55.0 to 56.0°F (Boles 1988).

Adult female chinook salmon prepare redds in stream areas with suitable gravel composition, water depth, and velocity. Spawning generally occurs in swift, relatively shallow riffles or along the edges of fast runs at depths greater than 9.5 inches. Both fall and spring runs spawn in temperatures between 42.1 to 57.0°F. Redds vary widely in size and location within the river. Preferred spawning substrate is clean, loose gravel, mostly sized between 0.5 and 4.0 inches, with no more than 5 percent fines. Gravels are unsuitable when they have been cemented with clay or fines or when sediments settle out onto redds, reducing intergravel percolation (NMFS 1997). Minimum intragravel percolation rate depends on flow rate, water depth, and water quality. The rate must be adequate to maintain oxygen delivery to the eggs and remove metabolic wastes. Chinook salmon have the largest egg size of the *Oncorhynchus* species and therefore their eggs have a small surface-to-volume ratio (Rounsefell 1957). Chinook salmon eggs are more sensitive to reduced oxygen levels and require a more certain rate of irrigation. The chinook salmon's need for a strong, constant level of subsurface flow may indicate that suitable spawning habitat is more limited in most rivers than superficial observation would suggest. After laying eggs in a redd, adult chinook salmon guard the redd from 4 to 25 days before dying.

Chinook salmon eggs incubate for between 90 and 150 days, depending on water temperatures. Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity. Maximum survival of incubating eggs and pre-emergent fry occurs at water temperatures between 42.0 and 56.0°F with a preferred temperature of 52°F. Emergence of spring and fall-run chinook salmon fry begins in December and continues into mid-April (Leidy and Leidy,1984 Bell 1991). Emergence can be hindered if the interstitial spaces in the redd are not large enough to permit passage of the fry. In laboratory studies, Bjornn (1968) observed that chinook salmon and steelhead fry had difficulty emerging from gravel when fine sediments (0.25 inch) exceeded 30 to 40 percent by volume. At the time of emergence from the redd, there is usually an extensive downstream dispersal of fry, although some fry are able to remain within the natal stream. For populations that spawn near tidal areas, this downstream migration may take the fry directly to estuarine rearing areas. In other populations, this migration serves to disperse the fry to suitable freshwater rearing habitat.

After emergence, chinook salmon fry seek out areas behind fallen trees, back eddies, undercut banks and other areas of bank cover (Everest and Chapman 1972). As chinook salmon fry grow larger, habitat preferences change. Juveniles move away from stream margins and begin to use deeper water areas with slightly faster water velocities, but continue to use available cover to minimize the risk of predation and reduce energy expenditure. Fish size appears to be positively correlated with water velocity and depth (Chapman and Bjornn 1969, Everest and Chapman 1972). Optimal temperatures for both chinook salmon fry and fingerlings range from 53.6 to 57.2°F, with maximum growth rates at 55°F (Boles 1988). Chinook feed on small terrestrial and aquatic insects and aquatic crustaceans.

Chinook salmon in the SOCC ESU exhibit an "ocean-type" life history; smolts outmigrate predominantly as subyearlings, generally during April through July (Myers et al. 1998). The low flows, high temperatures, and sand bars that develop in smaller coastal rivers during the summer months favor an ocean-type life history (Kostow 1995). In large rivers, fry tend to migrate along the margins of the river rather than in the higher velocity water near the center of the channel. When the river is deeper than about three meters, chinook salmon fry tend to prefer the surface waters (Healey and Jordan 1982). Along the emigration route, submerged and overhead cover in the form of rocks, submerged aquatic vegetation, logs, riparian vegetation, and undercut banks provide food, shade, and protect juveniles from predation. The "ocean-type" chinook salmon in California tend to use estuaries and coastal areas more extensively than stream-type chinook salmon for rearing. The brackish water areas in estuaries moderate the physiological stress that occurs during parr-smolt transitions.

Chinook salmon in the SOCC ESU generally remain in the ocean for two to five years (Bell 1991, Healey 1991). Available information on California chinook salmon populations indicates that the fish tend to stay along the California and Oregon Coasts while in the ocean. After this time, adult chinook salmon return to their natal stream to spawn. Some chinook salmon return from the ocean to spawn one or more years before full-sized adults return, and are referred to as jacks (males) and jills (females).

Current Legal Status

Listing history

On March 9, 1998, the NMFS proposed listing eight chinook salmon ESUs as either threatened or endangered (63 FR 11482). The SOCC ESU was proposed for listing as threatened. This ESU includes all naturally spawned coastal spring and fall-run chinook salmon from Cape Blanco, Oregon, to the southern extent of the species' current range at Point Bonita, the northern landmass marking the entrance to San Francisco Bay. According to the proposed rule, there is a general downward trend in populations within this ESU. Of particular concern is all populations in California and spring-run chinook salmon throughout the ESU. South of the Klamath River, coastal chinook salmon populations are "extremely depressed." Critical habitat was also proposed concurrently with the proposed listing.

Threats

The following discussion is taken from the proposed rule. The California Advisory Committee on Salmon and Steelhead Trout (1988) identified habitat blockages, fragmentation, logging and agricultural activities, urbanization, and water withdrawals as the predominant threats facing anadromous salmonids in California. The proposed rule also noted that CDFG (1965) reported that the most vital habitat factor for coastal California streams was "degradation due to improper logging followed by massive siltation, log jams, etc." CDFG (1965) also cited road building as another cause of siltation in some areas. NMFS (1996) concluded that destruction and modification of habitat, overutilization for commercial and recreational purposes, and natural and human-made factors were the primary reasons for the decline of west coast steelhead and other salmonids, including chinook salmon.

The proposed rule notes several factors that threaten chinook salmon. These include water diversions for agriculture, flood control, domestic supply, and hydropower purposes that have greatly reduced or eliminated historically accessible habitat. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Sedimentation, from extensive and intensive land use activities such as timber harvesting, road building, livestock grazing, and urbanization, was identified as a primary cause of habitat degradation in the range of chinook salmon. Ocean harvesting was also identified as having contributed to the decline of some chinook salmon populations. Chinook salmon still support tribal, commercial, and recreational fisheries throughout their range. Predation by introduced species and marine mammals was identified as a concern in areas where chinook salmon run sizes are dwindling, but the proposed rule, citing several studies, noted that salmonids appear to be a minor component of the marine mammal diet. The NMFS (1997) has recently determined that although pinniped predation did not cause the decline of the chinook salmon populations, in localized areas where they co-occur with chinook salmon (especially where they concentrate or passage may be constricted), predation may preclude recovery. Specific areas where predation is/may preclude recovery cannot be determined without extensive studies.

Land and water management policies (Northwest Forest Plan, PACFISH, CALFED) were identified in the proposed rule as probably beneficial to chinook salmon populations, but the confined scope of these management plans limit their effectiveness. Current state forestry rules in California, Oregon, and Washington were identified as not adequately protecting chinook salmon or providing for PFC. Other problems identified in the proposed rule include dams with no passage facilities, water diversions, mining activities, artificial propagation programs, and recent major flood events. Over the range of the species, NMFS proposed listing eight ESUs due to destruction and modification of habitat, overutilization for recreational purposes, and other natural and human-made factors. Since the proposal to list the SOCC ESU was published, these threats have remained constant and no new threats have been identified.

Conservation needs

The conservation needs for chinook salmon are similar to those identified for coho salmon, above.

Status and Distribution

Available historical and recent SOCC ESU chinook salmon abundance information is summarized in the status review (Myers et al. 1998). Following are some excerpts from this document.

Based on cannery packing data in the range of this ESU, a run size of about 225,000 fish existed around 1917. Estimated escapement of the California portion of this ESU was estimated at about 88,000 fish, predominantly in the Eel River (55,500) with smaller populations in the Smith River (15,000), Redwood Creek, Mad River, Mattole River (5,000 each), Russian River (500), and several small streams in Del Norte and Humboldt Counties. Based on the 1968 angler catch records for the Oregon portion of this ESU, the average escapement for the entire ESU in the 1960s was estimated to be 178,000 fish.

Dam counts of upstream migrants are available on the South Fork Eel River (1938 to 1975), and at Gold Ray Dam on the Rogue River (1944 to present). In 1953, Oregon began using catch report cards to report angler catch in rivers and estuaries, and this system provides estimates on catch on a river-by-river basis, which can be expanded to provide estimates of terminal run-size. Expanded angler catch data produced a 5-year geometric mean spawning escapement of 132,000 (run-size of 148,000) for the Oregon portion of this ESU. The majority of this escapement (126,000) has been the spring and fall-runs in the Rogue River. No total escapement estimates are available for the California portion of this ESU, although partial counts indicate that escapement in the Eel River exceeds 4,000 fish.

Data available to assess trends in abundance are limited. Recent trends have been mixed, with predominantly strong negative trends in the Rogue and Eel River Basins, and mostly upward trends elsewhere. Longer-term trends, where data are available, are flatter (e.g., Rogue River). Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. The AFS Endangered Species Committee (Nehlsen et al. 1991) identified seven stocks as at high extinction risk and seven stocks as at moderate extinction risk. Higgins et al. (1992) provided a more detailed analysis of some of these stocks, and identified nine chinook salmon stocks as at risk or of concern. Four of these stock assessments agreed with Nehlsen et al. (1991) designations, while five fall-run chinook salmon stocks were either reassessed from a moderate risk of extinction to stocks of concern (Redwood Creek, Mad River, and Eel River) or were additions to the Nehlsen et al. (1991) as stocks of special concern (Little and Bear Rivers). In addition, two fall-run stocks (Smith and Russian Rivers) that Nehlsen et al. (1991) listed as at moderate extinction risk were deleted from the list of stocks at risk by Higgins et al. (1992), although the U.S. Fish and Wildlife Service reported that the deletion for the Russian River was due to a finding that the stock was extinct. Nickelson et al. (1992) considered 11 chinook salmon stocks within the ESU, of which four (Applegate River fall-run, Middle and Upper Rogue River fall-runs, and Upper Rogue River spring-run) were identified as healthy, six as depressed, and one (Chetco fall-run) as of special concern due to hatchery strays.

Proposed coho salmon critical habitat

The term "critical habitat" is defined in the Act (16 U.S.C. 1532) to mean: (1) the specific areas within the geographic area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management consideration or protection; and (2) the specific areas outside of the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential to the conservation of the species.

The definition also states, "Except in those circumstances determined by the Secretary, critical habitat shall not include the entire geographical area which can be occupied by the threatened or endangered species."

By this definition, critical habitat includes those areas that are essential to the "conservation" of a threatened or endangered species. The Act defines the term "conservation" as: ". . . to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary." (16 USC 1532).

Coho salmon critical habitat has been proposed for all river reaches accessible to listed coho salmon between Cape Blanco, Oregon, and Punta Gorda, California. Critical habitat for coho salmon would consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches within this area. In the SONCC ESU, critical habitat has been proposed for the following watersheds:

- Mattole River, California
- Eel River, California
- Mad River, California
- Redwood Creek, California
- Klamath River, Oregon and California
- Trinity River, California
- Salmon River, California
- Scott River, California
- Shasta River, California
- Smith River, California and Oregon
- Winchuck River, Oregon and California
- Chetco River, Oregon
- Illinois River, Oregon and California
- Rogue River, Oregon
- Applegate River, Oregon and California
- Pistol River, Oregon
- Elk River, Oregon

Current Legal Status

Designation history

On November 25, 1997, NMFS proposed the designation of critical habitat for the Central California Coast and the SONCC coho salmon ESUs (62 FR 62741).

Primary Constituent Elements

Description

Proposed critical habitat for the SONCC ESU coho includes all spawning sites, food resources, water quality and quantity, and riparian vegetation in riverine and estuarine reaches below longstanding, naturally impassable barriers and below dams that currently block access to habitats historically occupied by coho salmon. The adjacent riparian zone is defined as those areas within a horizontal distance of 300 ft from the normal high water line of a stream channel or adjacent off-channel habitats. Within these fresh water tributaries, habitat features identified in the proposed rule as essential to the survival and recovery of coho salmon include adequate (1) substrate; (2) water quality; (3) water quantity; (4) water temperature; (5) water velocity; (6) cover/shelter; (7) food; (8) riparian vegetation; (9) space; and (10) safe passage conditions.

Threats

Management activities that have been identified as potentially affecting the essential habitat features include water and land management actions of Federal agencies, including related or similar actions of other federally regulated or permitted projects. Activities that may require special management considerations include but are not limited to: land management, timber harvest, point and non-point water pollution, livestock grazing, habitat restoration, irrigation water withdrawals and returns, mining, road construction, dam operation and maintenance, and dredge and fill activities (including bank stabilization activities).

Status and Distribution

The proposed designation for the SONCC ESU includes all accessible reaches of rivers between the Elk River in Oregon and the Mattole River, California, including estuarine habitats and tributaries. Critical habitat does not include oceanic or nearshore habitats. Areas accessible to listed coho salmon are reaches below specific dams, listed below, or naturally impassable barriers. The dams identified by NMFS within the SONCC ESU are:

- Scott Dam (Lake Pillsbury), Eel River
- Matthews Dam (Ruth Lake), Mad River
- Lewiston Dam (Lewiston Reservoir), Trinity River
- Dwinnell Dam (Dwinnell Reservoir), Shasta River
- Irongate Dam (Irongate Reservoir), Klamath River
- Applegate Dam (Applegate Reservoir), Applegate River
- Lost Creek Dam (Lost Creek Reservoir), Rogue River

Proposed chinook salmon critical habitat

Critical habitat has been proposed for all river reaches accessible to listed chinook salmon within the proposed ESUs between San Francisco Bay, California and Puget Sound, Washington. Critical habitat for chinook salmon consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches within this area. In the SOCC ESU, critical habitat has been proposed for the following watersheds:

- Tomales Bay, California
- Drakes Bay, California
- Bodega Bay, California
- Russian River, California
- Gualala River, California
- Salmon Creek, California
- Big River, California
- Navarro River, California
- Garcia River, California
- Albion River, California
- Noyo River, California
- Ten Mile River, California
- Mattole River, California
- Eel River, California
- Mad River, California
- Redwood Creek, California
- Lower Klamath River, California
- Smith River, California and Oregon
- Winchuck River, Oregon and California
- Chetco River, Oregon
- Illinois River, Oregon and California
- Rogue River, Oregon
- Applegate River, Oregon and California
- Pistol River, Oregon
- Elk River, Oregon

Current Legal Status

Designation history

On March 9, 1998 (63 FR 11482), NMFS proposed to designate critical habitat for chinook salmon in California, Oregon, and Washington, concurrently with the proposal to list several ESUs.

Primary constituent elements

Description

Proposed critical habitat for the SOCC ESU includes all spawning sites, food resources, water quality and quantity, and riparian vegetation in riverine and estuarine reaches below longstanding, naturally impassable barriers and below dams that currently block access to habitats historically occupied by chinook salmon. The adjacent riparian zone is defined as those areas within a horizontal distance of 300 ft from the normal high water line of a stream channel or adjacent off-channel habitats. Within these fresh water tributaries, habitat features identified in the proposed rule as essential to the survival and recovery of chinook salmon include adequate (1) substrate; (2) water quality; (3) water quantity; (4) water temperature; (5) water velocity; (6) cover/shelter; (7) food; (8) riparian vegetation; (9) space; and (10) safe passage conditions.

Threats

Activities that may affect the essential habitat requirements of chinook salmon include water and land management actions including livestock grazing, hydropower sites, dams, logging, road construction, mining, dredge and fill, and bank stabilization. Additionally, pesticide use, even according to labeling restrictions, could affect chinook salmon critical habitat.

Status and Distribution

The proposed designation for chinook salmon critical habitat consists of the water, substrate, and adjacent riparian zone of accessible estuarine and riverine reaches within all ESUs proposed for listing. Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of chinook salmon. Inaccessible reaches are those above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) and specific dams within the historical range of each ESU. Within the SOCC ESU, critical habitat is designated to include all river reaches and estuarine areas accessible to chinook salmon in the drainages of San Francisco and San Pablo Bays, westward to the Golden Gate Bridge, and includes all estuarine and river reaches accessible to chinook salmon on the California and Southern Oregon coast to Cape Blanco (inclusive). Excluded are the Klamath and Trinity Rivers upstream of their confluence. Also excluded are areas above longstanding naturally impassable barriers or above specific dams identified below:

- Kent Lake Dam/Nicasio Reservoir- Nicasio Creek
- Lake Mendocino - Russian River
- Lake Pillsbury - Eel River
- Applegate Dam - Applegate River